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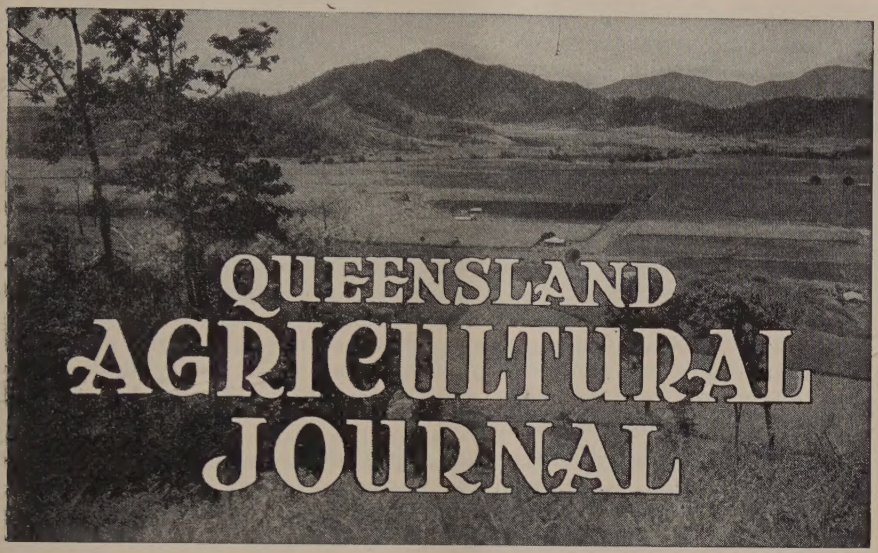

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Event and Comment.

Soil Surveys Before Settlement.

IN a general rural survey which constitutes the First Report of the Rural Reconstruction Commission factors influencing costs of production are discussed, including the growing of crops in the wrong places. One of the first essentials of success in any farming enterprise is that it shall be located in the right place, that is where soils, topography and climate are suitable. In discussing this point, the Commission states, *inter alia*:—

> In the past many land settlement schemes have been prepared by trained surveyors many of whom have a practical knowledge of soils and vegetation they bear in relation to agricultural potentiality. For soils which have no exceptional features this method of survey is successful, but, in the case of new types of soil and in areas where especial difficulties (*e.g.*, deficiencies of "minor" elements) occur, the lack of scientific experience has often led to farming disaster and, unfortunately, in some cases where knowledge was available, it was not used as it should have been. Rice and citrus growing offer instances of the close relation which exists between scientific soil type and successful production. Permanent success of the former is only achieved where soils are heavy and impermeable, while the cultivation of the navel orange is seldom completely successful except on one or two very special soil types. It was urged on the Commission, in the course of its investigation, not to encourage any new plantings of citrus groves except on the correct soils, as groves in the wrong place or in the wrong district were bound to have low yields and high costs . . . . There are many other instances where farmers have continued for a long time to carry on farming on soils not particularly suited to the crops they are growing, with resultant high costs and poor financial

returns. The Commission therefore considers that much more attention should be paid in future to the scientific survey of the soils of any area considered desirable for land settlement, and that settlement should not be planned until the suitability of the soil for the intended type of agriculture has been assured.

More Butter and Cheese Urgently Needed.

UP to the present, dairy farmers have done a very fine job in face of difficulties of transport, wartime shortages of many things they need most and with much less help, to say nothing of seasonal worries. Probably no section of the community has responded more readily to the calls which have been made on it than the dairy industry. Normal production, however, is not enough to meet the heavy and growing demands of Australia's fighting men, those of our Allies, the people of Britain, and our own civilian population. One more pint of milk a day from every cow now in profit would more than supply the present required increase in production.

In the same way as the nation appealed successfully to the young men and girls who have joined the Forces and to all other sections to exert every effort in the cause of Australia and other of the United Nations, it is now appealing confidently to the dairy industry. Victory is assured, but how long it will take to achieve depends very largely on an adequate food supply—and dairy products to-day are among the foodstuffs needed most urgently. It is not a question of guns or butter, but butter for the gunners. So another pint of milk from every cow in milk will help to bring the day of victory nearer and succour to the starving populations in the devastated countries who appeal so strongly to our common humanity.

Leadership in the Land Industries.

STRONG leadership in agriculture generally, but particularly in agricultural organisation, is a clamant need of the present time. No one can do a job better than the man most interested in getting the job done. Yet, in leadership, there is something more required than regard for one's own occupational interest, including a balanced adjustment of all interests. With their wide background and the wholesome traditions of the open country, leaders from the land can bring to their national job a breadth of view, a judicious balance and a tolerant understanding. As in other days Cincinnatus was called from the plough to lead his country in time of crisis, there are probably many young potential leaders who may be called from the tractor, or who may come home from active service with the fighting forces, to give the leadership which is required and who may be well aware of—

"That impulse Agriculture gave
To human progress everywhere
On solid land and rolling wave
And in the air."

As now, when the war is over there will be a tremendous demand on capacity for leadership in rural industries. Ability to grow things is not enough, and payable and stable markets for what is grown should be a first consideration. To marshal our farming resources and produce with confidence will be easy, if we master the problems of marketing and distribution.

The Peanut.

J. A. KERR.

THE peanut plant is a source of highly nutritious food both for human beings and for farm livestock. The uses to which the crop is put are many, and its importance is steadily increasing. As a human food, the kernel itself is consumed raw, salted, or roasted; it is used in various forms of confectionery and in margarine manufacture, and is also marketed as peanut paste and oil. As a stock food, peanut meal contains up to 48 per cent. crude protein and ranks as a high-grade palatable product. The crop may be eaten down by pigs, but its consumption by them will result in objectionable qualities in the carcasses. Breeding sows and weaners, however, may be fed limited amounts without detriment. The tops of the plant make a useful though rather coarse hay, which is inferior to cowpea hay both in yield and protein content. The residue of the crop, after threshing to remove the nuts, is often stacked as reserve fodder.

The peanut is regarded as being a native of Brazil, where several closely allied species are found. It is an annual summer-growing plant which is easily killed by frost, but it will otherwise adapt itself to a

Plate 45.

A Mature Peanut Crop in the South Burnett District.

wide range of climate, provided soil conditions are favourable. Moderate rainfall, abundance of sunlight, and comparatively high temperatures give the best results with this crop.

The flavour of the kernel and the type of the shell enclosing it have led to the fruit of the peanut plant being incorrectly known as a nut; however, as the plant belongs to the pea family, the fruit is really a pod. Like other members of that family, the roots bear numerous nodules containing bacteria which make nitrogen in the air available to the plant.

The plants (Plate 45) grow to a height of from 12 to 18 inches and may be of either a bunched or a running habit, the former type being preferred. Owing to its less straggly habit of growth, cultivation of the bunched type of peanut is much easier and harvesting is very much simpler than in the case of a variety possessing a running habit.

The flowers, which are small and yellow, are borne in the axils of the leaves. After pollination, the flower stalk elongates, bends downwards, and carries the developing pod into the soil. This flower stalk is commonly known as a peg, and the pod does not develop unless the peg penetrates the soil.

The period of growth in the case of peanuts varies from sixteen to twenty-two weeks, according to the variety grown, the district in which it is grown, and the seasonal conditions experienced during the growth of the crop. Early maturity is usually characteristic of the upright or Spanish type of plants.

The yield of peanuts per acre will naturally vary greatly with the soil fertility and with the climatic conditions experienced during growth. Yields of as much as 180 bushels per acre are obtained when conditions are ideal, but 75 bushels per acre may be regarded as an average. The

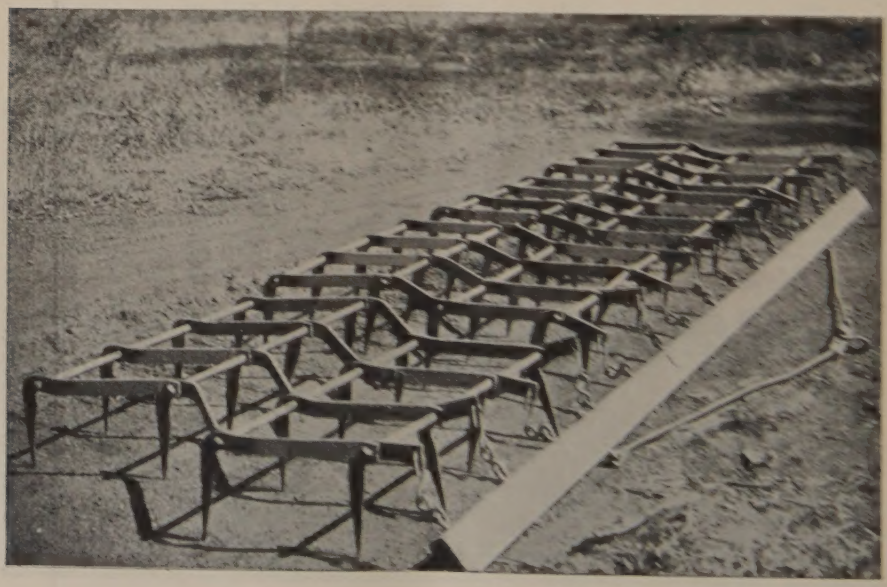


Plate 46.
A Peanut Harrow.

average bushel weight of peanuts as deliverd by the thresher is 17 lb. for the Virginia Bunch variety and 22 lb. for the Red Spanish variety.

Suitable Soils.

Well-drained, open-textured soils with a high humus content are the most suitable types for the growth of this crop. However, satisfactory crops can be grown on a wide range of soils, but heavy soils which are inclined to become hard and compact should be avoided. Heavy soils frequently produce large crops of peanuts, but considerable losses are experienced on them when harvesting, particularly in varieties which readily shed the pods. Other things being equal, sandy loams usually produce the best results.

Rotations for Peanuts.

Observations indicate that the first crop of peanuts on a soil is usually particularly good, yields of as much as 120 bushels per acre being frequently obtained. Uninterrupted cropping with peanuts, however, reduces the yield to an uneconomic level within a few seasons, and in few crops grown under Queensland conditions is a suitable rotation so essential to the maintenance of a satisfactory standard of production.

The eradication of all weeds in the growing crop, which is essential for the successful production of peanuts, combined with the method of harvesting, entailing as it does the removal of practically the whole plant, results in a serious lowering of the humus content of the soil, with a consequent adverse effect on its physical structure. The combined effect thereof is reflected in reduced yields. An undesirable variation in the ratio between the different soil nutrients following continuous cropping with peanuts is probably also responsible for a reduction in yield.

The selection of suitable crops for rotation with peanuts depends upon the type of farming practised, but where dairying is combined with peanut-growing the problem is somewhat simplified. Queensland climatic conditions are such that the main selections must be made from summer crops, supplemented, however, where possible, by winter crops. Maize, grain sorghums, saccharine sorghums, Sudan grass, white panicum, Japanese millet, and potatoes provide some of the possible selections for summer growth. Cowpeas should also be included in the rotation, but there is some evidence to the effect that they should precede the abovementioned fodder crops rather than the peanut crop. All residues of ordinary crops included in the rotation should be ploughed in, and in the case of the more open soils a bulky fibrous crop, such as Sudan grass, should be included in the rotation and ploughed in as a green manure prior to the planting of the peanut crop. The beneficial results obtained from Rhodes grass as a soil renovator, as indicated by first-crop peanut returns following that grass, suggests the adoption of the practice of grassing available cultivation areas from time to time for periods of from two to three years.

The restriction of peanut-growing to one crop in three years, or to two crops in five or seven years, may prove to be necessary if satisfactory production is to be maintained. The benefits of the rotation will not be limited to the peanuts, but will also be apparent in the other crops which are included in the cropping programme. A rotation, however, must be adopted at an early stage in the utilisation of a farm in order

to achieve the highest degree of maintenance of soil fertility, and not merely as a measure adopted at a later date to restore the fertility of soils which have been mined rather than farmed. The use of appropriate fertilizers may prove to be necessary and economically sound in rotation, but fertilizers alone will not be sufficient, and planned rotations, suited to the district and the soil, must be adopted.

Soil Preparation.

A field comparatively free from weeds should be selected for the production of peanuts in order to reduce hand work in the growing crop, and cultivation prior to planting should be thorough. If no cover crop is being grown during the winter, the first ploughing should be completed by May or June and should be across the slope of the land, which is then allowed to lie in a rough state until spring. Spring ploughing should then be followed by cultivation with the object of producing a loose, fairly fine seed-bed and conserving moisture. A further ploughing may be necessary, but the amount of cultivation required will naturally vary with the soil type and with the weather conditions.

Plate 47.
A PEANUT CUTTER.

Varieties.

Only two varieties are grown extensively in Queensland, these being the Virginia Bunch and the Red Spanish. The former is a strong-growing variety, and produces a large quantity of dark-green foliage. Virginia Bunch plants, on suitable soils, may reach a height of 12 to 18 inches and a diameter of from 24 to 30 inches. The pods are usually borne fairly close to the centre of the plant, but late flowers may

develop and fruit along almost the whole length of the branches. The pods are fairly smooth, of good size and shape, and usually contain two pale-coloured kernels. On maturity, these pods generally break off easily, thus resulting in loss in cases in which harvesting is delayed. Peanuts of the best quality of this variety are usually reserved for the "whole nut" trade. The Red Spanish variety is a smaller plant of semi-erect, bushy habit, with light-green foliage. Its pods, which are closely clustered round the main stem, are small and completely filled with two dark-red kernels. On maturity, they do not break off easily, and so do not present a harvesting problem, as may be the case with the Virginia Bunch variety. On account of their high oil content, Red Spanish kernels are frequently used for the oil trade, but they are also used for the manufacture of peanut paste and are consumed as salted and devilled kernels.

Plate 48.

A Close-up View of a Hill of Peanuts with the Soil partially removed, to show how the Blade of the Peanut Cutter passes under the Hill.

Planting.

The planting season extends from October to January, inclusive, the later date of planting being usual in the north. Peanut planters and maize drills fitted with special peanut plates operate in a very satisfactory manner for planting. These mechanical planters plant shelled seed only, and, with them, even-graded seed is necessary to ensure the fairly regular spacing of plants. Small areas may also be planted by hand in shallow furrows opened at the desired spacing of the rows. When planting is done by hand, the use of shelled seed is not essential. The whole pod or the pod broken in halves may, therefore, be used, but the germination thereof is slower than is the

case with shelled seed. Soaking of the pods prior to planting may prove to be advantageous. A width of 36 inches between the rows and a plant spacing in the row of from 15 to 21 inches is recommended for the Virginia Bunch variety, this spacing requiring approximately 25 lb. of seed per acre. For the Red Spanish variety, a width of from 30 to 36 inches between the rows with a plant spacing of from 8 to 15 inches in the row is recommended. The seed of the Red Spanish variety is smaller than that of the Virginia Bunch, and approximately the same sowing rate, 20 to 25 lb. per acre, is therefore adequate for the closer spacing usually adopted in the case of the former variety. The seed should be sown at a depth of 2 to 3 inches.

The treatment of Virginia Bunch seed with Ceresan, Agrosan, or similar organic mercury dusts, is very desirable in order to ensure satisfactory germination.

Cultivation of the Crop.

Crop cultivation for the first month after planting may be carried out with light peanut harrows (Plate 46) dragged across the rows. Ordinary light lever harrows may also be used. The initial harrowing may be done shortly after the first plants appear, and the judicious use of the harrows in this early stage of the growth of the crop considerably reduces later hand work, by virtue of the fact that the harrowing eradicates many weeds in the row. Inter-row cultivation should be continued until the first pods are developing. At least one hand chipping will probably be necessary to ensure the eradication of

Plate 49.

CAPPING A STOOK OF PEANUT PLANTS.

weeds. During the last cultivation a slight hilling is frequently given with the object of providing a free entrance for the fruiting pegs.

Harvesting and Marketing.

As the peanut crop does not mature evenly, harvesting is carried out when the majority of the pods are mature. The plants at that stage usually develop a yellowing of the foliage, but as that is not invariably the case, an examination of the pods is necessary before a decision is made to harvest the crop. The inside of the shell usually begins to colour, at least at one end, and shows darkened veins when

Plate 50.
A Stooked Peanut Crop Drying for Threshing.

maturity has been reached. In the case of the Virginia Bunch variety, a few of the early pods are usually lost, but no difficulty in this respect is experienced with the Red Spanish variety, which retains its pods for a considerable period after they have reached maturity.

Before pulling the plants, the taproot may be cut by a blade attached to a cultivator frame; the blade employed for such a purpose is usually about 30 inches long, and is adjusted to cut just below the level

Plate 51.
Threshing Peanuts in the South Burnett District.

of the pods (Plates 47 and 48). A single-furrow mouldboard plough with the mouldboard removed also acts as a fairly satisfactory cutter, but the attachment of a special share with an extended blade improves the cutting. The action of cutting also loosens the soil around the plants and thereby facilitates pulling.

After cutting, the plants are pulled by hand and placed in bundles of a size convenient for handling when stooking, the soil being simultaneously shaken from the plants. Combined mechanical cutters and pullers have so far not proved satisfactory.

The usual practice is to stook the plants without support. The plants from eight to twelve rows are generally placed in a single line of stooks, the average size of the stooks being about 30 inches in diameter and 3 feet in height. The first plants are placed on the ground with the pods upwards, followed by some other outer plants with the pods towards the centre. The stooks can then be built in successive layers, each bundle of plants being firmly placed in position with the pods always to the centre of the stook. The last 12 inches are tapered to a point and capped by a plant with the foliage directed downwards with the object of shedding as much rain as possible.

Stacking around poles is rarely adopted in Queensland for curing the crop prior to threshing. For that purpose, poles about 7 feet long are driven firmly into the ground and two cross-pieces 3 feet long are nailed on to the poles at right angles to each other about 9 inches from the ground. The first plants are placed on these cross-pieces in order to keep the pods off the ground, and the stack is then built round the pole with the pods inside. Towards the top of the pole the plants are so arranged as to gradually taper off the stook, which is capped by using inverted peanut plants or grass. From twenty to thirty poles are required per acre for curing the crop in this manner.

Dry weather is essential for the first week after pulling, in order to allow the plants to dry, but after that period has elapsed rain damage is usually of minor importance, unless continued for long periods. Unfavourable harvesting weather produces a darkening of the pods, and moulds may develop under such conditions, with a consequent loss of quality, and they may even cause the destruction of a large percentage of the crop.

The peanut plants may remain in the stooks for a period of from fourteen to twenty-eight days, the duration of the period depending on the prevailing weather conditions. The plants must be dry and the pods must shatter easily from the pegs before threshing is attempted. Threshing is usually done by contractors who operate machines designed for handling this crop. The stooks are generally conveyed on low waggons to the thresher, which is moved from time to time to convenient positions in the field. The plant residue, after the thresher has removed the pods, is frequently stacked in the field in the position in which it is delivered from the threshing machine, and is subsequently used as fodder.

Associated with the marketing of this crop is the Peanut Board, which was established in 1924. Since then, the Board has erected and now controls extensive silos, shelling and cleaning machinery, and other equipment. The main storage facilities are provided at Kingaroy, but there are also Board depots at Brisbane, Atherton, and Rockhampton.

Cowpea.

A. HAMILTON.

THE cowpea is a vigorous growing summer annual, most varieties of which produce long runners of a twining habit of growth although some are of a more erect bushy nature with tendrils only a few inches in length. Like other legumes it has the power of growing in association with certain nitrogen fixing bacteria. When such an association is established, characteristic nodules are developed on the roots and inside these nodules the bacteria absorb nitrogen from the air and pass it on to the plant. It is important to note that effective nodulation is achieved only when nodules are well developed on the tap root and main branches as well as elsewhere on the rooting system.

The use of cowpea for green manuring purposes is perhaps one of the oldest of farming practices, its value as a green manure having been appreciated for centuries. It is used most extensively in Queensland for this purpose, especially in the sugar-growing districts, and while it is also used for haymaking and grazing, it is not yet used, particularly for grazing, to anything like the extent it should be. It is frequently stated that difficulty is experienced in getting dairy stock to graze cowpea while in a green state, but as a rule stock do not take long to acquire a taste for it and they then eat the crop with relish. To accustom stock to the crop it has been found a good practice to sow a light sprinkling of maize with the cowpea seed. The cowpea vines twine round the maize plants and the stock, in singling out the maize plants, cannot avoid also eating some of the cowpea vines and thus acquire a taste for them. Cowpea is also of value for silage making, although when used alone it does not make good silage; it is, however, excellent for mixing with other silage crops such as maize or sorghum. Finally the value of the immature cowpea pods as a green vegetable is not by any means fully appreciated; they are an excellent substitute for ordinary culinary beans.

The plant, being of tropical origin, thrives and produces its heaviest growth under warm moist conditions. Nevertheless, cowpea has a marked capacity to survive dry spells once the plants are established, and will produce fodder during seasons when many other crops fail. The crop is very susceptible to frost and this should be borne in mind when arranging planting dates. Cowpea may be grown successfully on a wide range of soils, but it is not recommended for low-lying, poorly aerated land. It is particularly valuable both on poor sandy soils and where erosion has impoverished hill soils. It serves to build up the fertility of such land sufficiently to enable it to produce suitable crops requiring considerable supplies of nitrogen.

Preparation of Seed-bed.

The cowpea, like all other crops, responds to good cultivation and gives results in proportion to the care with which the seed-bed has been prepared. An early and thorough preparation of the land is necessary to obtain the best results, and the same treatment should be afforded the land as is given for maize. When this is done, a fine, firm seed-bed should result and this will contribute greatly towards a good germination.

Sowing.

The best time to sow cowpea depends on the locality and also on the purpose for which the crop is to be grown. When it is required for haymaking purposes, it is essential that sowing be so arranged that the crop will be in the correct stage for converting into hay at a time of the year when fine weather can be expected. In most districts, about mid-December will be found to be a very suitable time for sowing as a green manure, as a hay crop, or as a grazing crop; if, however, it is required for seed production, sowing is best deferred to the end of December.

When required as a green manure or for grazing or haymaking the seed is frequently sown broadcast, but when the crop is grown for seed purposes it is necessary to sow it in rows just wide enough apart to permit of inter-row cultivation, the usual spacing being 2 feet 6 inches between the rows. It is very doubtful, however, if broadcast sowing has any advantages over drill sowing no matter for what purpose the crop is grown. Much less seed is required where the latter method is adopted, inter-row cultivation keeps weed growth in check until the plants are established, and at least the same bulk of green material is produced. Broadcast sowing should be carried out only on land on which the young plants will not have to contend with heavy weed growth, and also only when weather and soil moisture conditions are favourable. Broadcasting should be carried out while the land is in a rough state just after the last ploughing and should be followed immediately by a good harrowing. When sown on a rough surface a much better cover of seed can be effected than when it is sown on land with a well-worked even surface. An ordinary single or double row planter is very suitable for sowing, the seed being sown at a depth of approximately 2 inches.

The sowing rate varies considerably owing to variation in the size of the seed and from 8 to 15 lb. per acre is required when sown in drills 2 feet 6 inches apart and from 30 to 50 lb. per acre when sown broadcast. The quantities given are for coastal districts and those districts which usually are favoured with good summer rains, but for inland districts the quantities of seed per acre could be reduced somewhat.

Occasionally cowpea is sown as a mixture with maize or sorghum (Plate 52) on the Atherton Tableland when required for silage purposes, but this method cannot be recommended as a general practice throughout the State as it will be found that usually a greater weight of material per acre is obtained when the crops have been grown separately. Harvesting is also simplified because a combined crop of maize or sorghum and cowpea is frequently very difficult to handle.

Varieties.

Poona is an upright growing, moderately late variety which, owing to the hardiness associated with its deep root system, its favourable habit of growth and prolificness is universally favoured for silage, green manuring, or haymaking. The seed, which is the smallest of any cowpea in general cultivation, is a light clay colour and is produced in large quantities in short pods. This variety possesses the undesirable habit of maturing its pods unevenly and seed harvesting is accordingly

Plate 52.
Sorghum and Groit Cowpea.

difficult. Less than half the ordinary amount of seed per acre of this variety is sufficient for sowing purposes.

Victor (Plate 53) is a very prolific, tall, half-bushy variety which produces a great bulk of leaf and vine and is thus very suitable for green manuring and haymaking purposes. The medium-sized seed, which is produced in large quantities, is buff coloured, with a brown marbling, and is sprinkled with very small blue specks.

A medium late, tall, half bushy variety is Brabham, which is a prolific seeder and produces a large mass of vine and foliage. The roundish seed has markings similar to those of Victor and is borne in long white pods. It is suitable for green manuring purposes.

Black is a moderately late somewhat prostrate variety, which, under favourable conditions, gives a heavy yield of vine and seed. For these reasons it has been for many years one of the most favoured varieties for green manuring purposes. It produces large pods which, as its name suggests, contain large black seed.

The Mammoth or Giant variety has derived its common name from its very large clay-coloured seed. It is a late maturing, rather prostrate variety which freely produces a coarse vine and foliage and is used fairly extensively in some localities for green manuring purposes. It is a moderately shy bearer. Double the amount of seed per acre that is normally required for sowing cowpea must be used in the case of this variety because of the great size of its seed.

The Groit cowpea is another late-maturing variety with a semi-upright habit of growth which enables it to climb any available support. It is a vigorous grower, but is finer in the stem than the Mammoth or Giant variety, and produces a heavy mass of vine and foliage, but not so much as does the latter variety. It may be used for green manuring purposes. The seed coat markings are similar to those described for Victor.

Plate 53.
VICTOR COWPEA.

One of the earliest-maturing varieties is Black-eyed Susan, but owing to its comparatively poor habit of growth it is not used as a green manure. The seed, which is produced in moderate quantities, is of medium size and is white with a black patch surrounding the seed scar which marks the point at which the seed was attached to the seed pod. It is suitable, when in a dry ripe state, for culinary purposes, cooked like ordinary dried peas.

Clay is a small variety which was once one of the most favoured varieties in this State, but it has long been superseded by more prolific types.

Both Victor and Poona are resistant to nematode infestation, and Brabham also has some merit in this respect but to a lesser degree; the status of other cowpea varieties with respect to nematode attack in Queensland is not yet quite clear.

Green Manure.

When cowpea has been grown as a green manure (Plate 54), the crop should be ploughed under when the pods are well formed but

before they have commenced to ripen. Difficulty may be encountered in ploughing under a heavy crop, but that difficulty can be largely overcome if a disc harrow or similar type of implement is used to flatten and partly chop the vines just prior to ploughing. Where a disc harrow is not available, a roller may be used to advantage, the crop being rolled down in the direction in which the plough will follow—i.e., one half of the land should be rolled in one direction, say, north, and the other half in the opposite—i.e., southerly direction. The plough should follow the roller as soon as possible and while the vines are still fresh and green.

Plate 54.
A Cowpea Crop on a North Queensland Farm.

The soil should be in a well-moistened condition at the time the crop is ploughed under as it is difficult to get a good cover in dry soil, and furthermore, what little soil moisture is present in a dry or slightly moistened soil will largely be lost as a result of the ploughing, and the decomposition of the vines will thereby be seriously delayed.

A disc plough is much more satisfactory than a mouldboard plough for turning the crop under, especially for crops which have not previously been treated by discing or rolling. Rolling the land, immediately after ploughing under has been completed, will usually accelerate decomposition and is therefore recommended except, of course, on soils on which it is not advisable to use a roller.

Haymaking.

Cowpea makes a nutritious hay which is readily eaten by stock, but great care is necessary during curing in order to reduce the moisture content of the stems sufficiently to permit of safe storage, and at the same time retain the leaf. Providing a suitable variety is used and the crop was sown thickly enough to encourage the production of fine stems,

a good-quality hay can be made with ordinary care. The crop should be cut when the pods are fully developed but before they commence to ripen.

Harvesting for Seed.

Crops required for seed purposes are usually sown in rows to facilitate harvesting. The general practice is either to pull the vines by hand or to cut their main stems with a cane knife or other suitable tool and then to roll them into heaps. Owing to the twining nature of the vines, cutting the crop with a mower is very difficult unless a special side attachment is affixed to the mower, and even then, much wastage usually occurs.

The crop is allowed to remain in the field in small heaps until cured, when threshing may be carried out straight away or the crop may be stacked to be threshed at some future date. When dealing with comparatively small areas, the usual method of threshing is with a flail, but for large areas machine threshing is at times resorted to. However, when an ordinary thresher is used great care is necessary to make the required adjustments, otherwise a large percentage of the seed will be cracked or destroyed.

Cowpea seed is very susceptible to damage by pea and bean weevils, and the usual precautions which are taken when storing other grain should also be taken in this case.

ROTATIONS WITH SORGHUMS.

Sorghums are sometimes considered to excessively deplete the fertility of soils, as non-leguminous crops following sorghums frequently yield less than normally anticipated. Other theories have suggested that the sorghum roots, during the growth of the plant, secrete a substance that is toxic or slightly poisonous to the following crops, as evidenced by the light, yellowish-green leaves of such crops, especially on soils that normally have a low nitrogen content, or on various types of soils in dry seasons.

Investigations in the United States of America indicate that the reductions in the yield of non-leguminous crops following sorghums are mostly due to the depletion of the nitrate nitrogen by the sorghum crop and to the amount of sugars in and near the crown of the sorghum plant. These sugars may be so concentrated that soil micro-organisms attempting to decompose them and the old sorghum roots during the period when the following crop is growing compete with that crop for the nitrates present, thus further reducing the supply of nitrates available for the crop following the sorghum.

Sorghums should, therefore, be grown in rotations in which either an inoculated legume is grown following the sorghum crop or in which the land is ploughed as soon as the sorghum is harvested or grazed off and is then left as a moist, bare fallow until the roots are properly decomposed before some other non-leguminous crop is sown. Both procedures should provide ample amounts of nitrogen for following non-leguminous crops if the nitrogen content of the soil was satisfactory prior to the growing of the sorghum crop. Generally speaking, unless the soil is very fertile it is advisable to follow a sorghum crop with a legume, after which any crop, other than cotton, may be grown prior to again growing sorghum.

Vegetable-Growing in North Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

PART 5.

The Cucumber.

THE cucumber is tolerant of a fairly wide range of soils, but best results are achieved on sandy loams of good depth and rich in humus. A constant supply of moisture also is necessary, as good results cannot be obtained unless vigorous growth of the plants is maintained. Ample plant food is required, as much as possible being of an organic nature. Where farmyard manure is not available, green manure crops should be ploughed under before planting cucumbers in a field. Artificial fertilizer should supplement the organic food supply rather than entirely take its place, if best results are to be achieved with crops of the cucumber family.

In coastal frost-free areas of tropical Queensland, the cucumber may be planted throughout the year. Best crops are, however, obtained in the spring, summer, and early autumn. Late autumn and winter-grown crops are often seriously affected by mildew, which restricts growth and cropping of the plants. The season on the highlands is restricted to the spring and summer months.

Planting may be done either in drills spaced about 6 feet apart, or in hills spaced 6 x 6 or 6 x 8 feet. In drill planting, seeds are sown thinly along the row and the plants thinned out to 2 feet to 3 feet apart during the first and second hoeings. When planted in hills, eight or ten seeds are sown in each hill and the plants subsequently thinned by hand to two or three. The comparatively high seeding is to allow for loss in the early stages of growth through the depredations of pumpkin beetles, cutworms, and other insect pests.

Early cultivation of the crop should be fairly deep to maintain the friable condition of the soil, but as the plants grow only the surface should be stirred, as many feeding roots of the plants keep within a few inches of the surface.

The standard variety at present grown in northern areas is Early Fortune. It is found to be very susceptible to mildew, however, and is being gradually superseded by a variety known either as Chinese, Japanese, or Oriental. This variety has been grown for many years by Chinese gardeners of the North. It is vigorous in habit, with large dark

green leaves and long, dark green fruit, and appears highly resistant to mildew. To avoid confusion with the bitter Chinese cucumber, it would perhaps be advisable to recognise this variety under the name of Oriental.

The cucumber is monoecious—that is, it bears male and female flowers separately on the one plant. A profusion of male flowers usually appears first, the female flowers following after the flush of male ones have fallen.

The fruit should be harvested while still young and tender and before the skin commences to turn yellow. As they mature rapidly, harvesting is necessary every second or third day.

The chief insect pests attacking this crop are pumpkin beetles and aphis. Fungous diseases—particularly mildew—also cause considerable damage and loss during certain periods of the year.

Marrow and Squash.

Botanically these two vegetables are members of the pumpkin family. They require similar climatic conditions for their growth and, like pumpkins, are very susceptible to frost. In coastal regions of the North they are normally grown during spring and autumn months, and on the highlands in spring and summer.

Both bush and trailing or vine types are available, but the bushes are the most suitable variety for northern culture, not only because of their easier cultivation and irrigation, but also because their compact habit of growth provides good shade for the roots, stems, and fruit.

The customary method of planting is either in hills or in hilled drills. If care is used in setting out the hills on the square, this method allows for cultivation both ways, thus reducing hand work to a minimum. Seeds should be sown direct to the field, as the seedlings will not transplant successfully. Land for these crops should be well prepared before seeding, as subsequent cultivation must be confined to the surface soil owing to the extensive shallow rooting system of the plants.

Varieties suitable for the North are Long White Fruited Bush Marrow and Early White Bush Squash.

Carrot.

Good carrot soil should be deep and loose. Depth is particularly necessary for the long types, but even the medium-long varieties, such as Chantenay, require more than average depth of soil for the production of roots of first quality.

The carrot is a cool weather crop, but it is quite tolerant of high temperatures. Furthermore, reasonably high temperatures—above 70 deg. F.—are necessary for good germination of the seed, while continuous low temperatures during the period of maturing are detrimental, as they tend to induce roots pale in colour. The autumn-winter-spring climatic conditions obtaining in North Queensland may, therefore, be considered very satisfactory for carrot culture, as the autumn season gives the temperatures necessary for successful germination, while the winter and spring months are cool enough for the production of a good quality carrot without, however, being so cool as to affect the rich colour of the root.

Rich soils are necessary, but heavy manuring of land immediately before planting carrots is not advisable because of the tendency to promote forking of the roots. Artificial fertilizer should be placed fairly deeply in the soil below the position the rows will occupy. If the soil is not already well supplied with potash, the fertilizer used should contain a fair percentage of this ingredient.

Seeding should be done direct to drills in the field and is best done with a seeding machine. Distance to allow between the rows depends on the cultivating equipment available.

Germination and early growth is slow, so that weeds will frequently smother the young plants before the rows can be followed to permit cultivation. The mixing of a few radish or turnip seeds with the carrots at planting will provide early marker plants, as both these seeds germinate very rapidly.

For the early control of weeds in the carrot rows, the application of a selective spray is recommended. A special carrot weedicide is now being manufactured. This spray should be used only at one stage of growth—namely, when the plants have two to four true carrot leaves. The effect of the spray is to kill the weeds and grass without injuring the carrots. Treatment at any later stage of growth than four leaves must not be applied, or the carrots will retain a kerosene flavour when harvested.

The variety of carrot recommended for northern planting is Red Cored Chantenay. This is a medium-long variety, only slightly tapering to a blunt end.

Celery.

Celery is strictly a moderate to cool climate crop, so its culture in North Queensland is practically restricted to the highland areas during the cooler months of the year. Production in coastal areas is not recommended commercially, although its growth in the home garden under special treatment is possible.

A light loamy soil having good water-holding capacity is desirable. Heavy clayey types should be avoided. High fertility is essential, and heavy dressings of organic manure as well as artificial fertilizers are desirable to supply the amount of nutriment required by the crop.

Celery should be raised in seed beds and transplanted to the field. The seed is rather slow in germinating, and may take anything from five to fifteen days to sprout. During this period the surface of the seed bed should be kept continually moist, as drying out is fatal to a satisfactory strike.

In transplanting to the field, it is desirable to set the plants sufficiently close in the rows for the tops to provide continuous shade over the rows. This assists in the blanching of the stalks, which is done by hilling or otherwise excluding the light from the stalks. Hilling tends to promote rots in the stems under warm climatic conditions, so boarding up is preferable in North Queensland. This is done when the plants are about three parts grown by placing boards 8 to 10 or 12 inches wide along both sides of each row and fixed in place with pegs driven into the ground. Boarding up may also be done with strips of paper mulch of the required width supported with bent wire pegs pushed into the soil.

Suitable varieties for growth in the North are Golden Self Blanching and White Plume.

Parsnip.

The parsnip is a long season crop and consequently receives little attention from commercial vegetable growers. It is adapted to a fairly wide range of climatic conditions and will thrive well in highland areas of the North, while good crops also have been produced at times in coastal areas. It requires a soil approaching neutral in reaction, and one that is rich, deep, and friable. A fine seed-bed must be prepared for the planting of this crop, as the young seedlings are weak and tender. Seed is slow in germinating, so the mixing of a few turnip or radish seed with the parsnip seed is recommended for marking of the rows to allow early cultivation. Seed of this crop should be fresh, as it loses its viability rapidly.

No special cultivation or other attention beyond ordinary practices is necessary for the production of the crop. The recommended variety is Hollow Crown.

Lettuce.

Lettuce is probably the most widely grown of salad crops among home gardeners. Recently, its commercial production has gained much popularity in northern areas. It is a crop that can be grown throughout the year in at least some part of the North.

In coastal areas, its commercial production is restricted to autumn, winter, and early spring. In the drier parts of the highland region, it may be grown throughout the year, and in the wet highlands at all times but the wet season.

For the production of high-quality lettuce, warm days, cool nights, and a plentiful water supply are necessary. High temperatures induce rapid seeding, and it is on this account that production in summer on the tropical coast is not practicable. Even on the highlands the summer crop is very loose headed and open and must be harvested early to forestall bolting.

For field production of lettuce, seeding direct to drills in the field and subsequent hand-thinning of the plants is recommended. Seeding is best accomplished with either the single or multiple row seeding machine, according to the area to be cropped. The seeding machine has the advantage over hand-sowing of even seeding rate and regular planting depth, thus ensuring a regular stand. Distance between drills should be regulated by the cultivating equipment available. Two methods of planting are commonly practised—namely, ridge planting and flat planting. In North Queensland ridge planting is only desirable when furrow irrigation is practised, or during the wet season period to assist in drainage. Apart from these exceptions, flat planting should be the general rule.

Where the soil is not naturally rich, a heavy dressing of complete fertilizer mixture is desirable at the time of planting. This should be followed by one or two side dressings with sulphate of ammonia or nitrate of soda during the growing period.

Varieties recommended for the main crop on coastal areas are Imperial 847, Imperial 44, and New York. During the warmer periods of the year—that is, in early autumn, late spring, and early summer—Mignonette is the only variety with which success can be obtained. In highland areas, Iceberg may be grown in the warmer periods, Imperial 847 in the autumn and spring, and New York in the winter. All these varieties are heading types.

Tomato.

Warm weather is necessary to promote vigorous growth of the tomato, but high temperatures inhibit fruit setting. On the other hand, frost will kill the plant.

In North Queensland the crop thrives best in the coastal area between autumn and spring, with the main harvesting period extending from June to October. Those portions of the highlands which are immune from heavy wet-season rains may plant for early autumn harvest, and if they are also free of frost may continue their production almost without interruption up to Christmas. Areas with heavy rainfall which are also subject to frost—such as the Atherton Tableland—can only grow this crop satisfactorily during late spring and early summer under irrigation.

The tomato grows successfully on a wide range of soils and is tolerant of a wide range of conditions. Special varieties have been developed to meet variations in soils and conditions. It is, therefore, necessary for each grower of this crop to discover for himself the variety most suited to his particular conditions. The Bowen district has, over the course of years, evolved for itself a variety—the Bowen Globe—generally suited to the conditions obtaining in that district. In other districts other varieties have given better results. The following list gives a number of varieties that are grown successfully in various parts of the North:—

Earliwinner.—A non-wilt-resistant, early maturing variety with smooth fruit. This variety has good foliage, which makes it suitable for early autumn growth in coastal areas.

Pritchard.—A wilt-resistant variety; globe type fruit, slightly pointed at apex; good foliage; early maturing.

Break o' Day.—Wilt resistant, vigorous sprawling plant; slightly flattened globe type fruit; medium maturing period.

Marglobe.—Wilt resistant, dense bushy growth; globular fruit rather subject to radial cracking at times.

Bowen Globe.—Wilt resistant, very vigorous sprawling plant, with fruit clusters mainly beneath the plant; heavy cropper. Fruit rather pale in colour.

Burwood Prize.—Non-wilt resistant, potato-leaved variety. Fruit slightly flattened globular with a tendency to run small towards the end of the crop. A good summer variety on account of its protective foliage.

Rutgers.—Wilt resistant, medium vigorous, late maturing variety. Fruit smooth flattened globular, in clusters of four to six.

Other varieties that have been grown successfully on a limited scale in various parts of the North are Salad Special, Pearson, Vetemold, and Tatura.

The method of growing may be either on stakes, on vertical trellises, on low trellises, or rambling over the ground. When grown on stakes, each plant should be pruned to a single stem and tied to a stake driven in firmly close to its root. The vertical trellis system requires stout strainer posts at each end of the rows with light supporting posts at intervals between and two wires strained at about 1 foot and 5 feet from the ground. Binder twine is strung up and down from one wire to the other.

The plants are pruned and the stems supported by twisting the binder twine round them. In the low trellis system low posts are driven into the ground to support cross pieces about 18 inches long 2 feet from the ground. A wire is strung along each end of the cross pieces. The unpruned plants grow up between the wires and drape down towards the ground again. This method partially supports the plants, keeping the bulk of the fruit clear of the ground. The fourth system allows the plants to grow unrestrainedly over the ground.

Distance of planting depends on the method of growing to be adopted and on the variety to be grown. Staked plants of the less vigorous varieties may be planted 18 inches apart by 4 feet between the rows. More vigorous varieties should have the rows spaced wider to allow for better circulation of light and air. When grown over the ground, planting may be 4 feet by 6 feet for the dwarf varieties up to 10 feet by 10 feet for the most vigorous kinds.

The length of time from flowering to first harvesting is about six to eight weeks, depending on the variety, and, under favourable conditions, harvesting should continue for one to two months.

Pests and diseases are very prevalent under North Queensland conditions. The corn-ear worm is constantly active and will cause heavy loss unless regular control measures are adopted. Tomato mite may cause serious defoliation of the late spring and summer crops. Fusarium wilt is very prevalent, particularly during the warmer periods of the year when soil temperatures are high. The use of wilt-resistant varieties is the best safeguard against this disease. Various leaf spots are also prevalent and require the use of copper sprays at regular intervals.

Capsicum.

While this plant is actually a biennial, it is normally treated as an annual under commercial cultivation. It is strictly tropical in its requirements, and successfully withstands heat that would be highly detrimental to tomatoes. Temperatures below 75 deg. F. cause slowing down in growth and delay in fruit setting and maturing.

Seed is rather slow in germinating, taking an average of ten days, whilst the seedlings require about two months to attain the transplanting stage. They are raised in the same manner as tomatoes. Distance of planting in the field is usually about 3 feet between the rows and 18 inches between the plants. The period from flowering to first harvesting is five to six weeks.

Both red and yellow fruited varieties are available, and the shape of the fruit varies from apple-shaped to narrow elongated. The apple-shaped types command the best market and also are the easiest to pack. For use as a salad vegetable they should be harvested as soon as they reach full size but before they commence to change colour from green to red or yellow.

The most generally planted variety is Ruby King. It gives good results throughout the northern area. Two other varieties of recent introduction that appear suitable for the North are Sunnybrook and Californian Wonder. All these are of apple-shape or elongated apple-shape.

Egg Plant.

The egg plant requires even higher temperatures than capsicums. It also withstands drier conditions than either the tomato or capsicum. An open, free type of soil is necessary—clay soils are quite unsuitable.

Seedlings are ready to transplant to the field in a month to five weeks from sowing of the seed. The young plants are very sensitive to handling and require careful treatment for successful transplanting. They should be set in the field at about 4 feet between the rows and 2 feet to 30 inches between the plants. Fruiting commences about ten weeks from transplanting, and the period from flower to mature fruit is three to four weeks. The fruit may be harvested at any time after it is about two-thirds grown. If allowed to reach full maturity some varieties grow to a considerable size—nine inches or more in diameter. Such large fruit are not popular on the market, however. Round fruit 4 to 5 inches in diameter are the most suitable commercial size, and the round varieties should be picked to this size. Long varieties are not so popular, but when they are grown should be harvested when not more than 9 inches in length.

New York Purple or New York Spineless is the best variety. It bears a globular fruit of very dark purple colour. Other varieties of paler colour are not regarded so highly. The long types, whether white, yellow or purple, are also less favoured.

HANDBOOK FOR QUEENSLAND FARMERS.

—oOo—

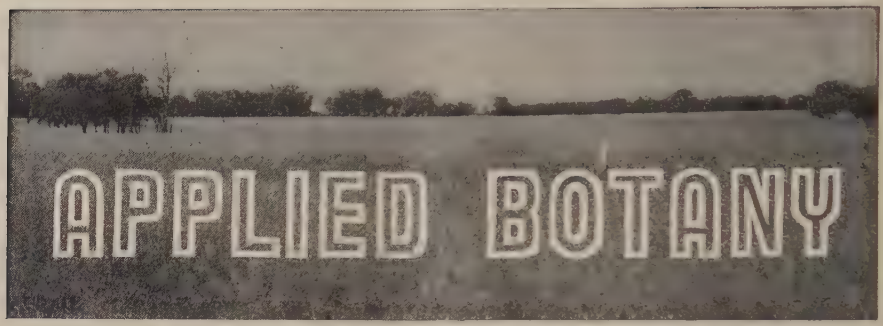
Readers are notified that VOLUME III.—INSECT PESTS AND PLANT DISEASES, and VOLUME IV.—SUGAR CANE AND ITS CULTURE—are now out of print.

Volumes of the **Queensland Agricultural and Pastoral Handbook** Series still available are—

VOLUME I.—FARM CROPS AND PASTURES (5s., post free);

VOLUME II.—HORTICULTURE (4s., post free).

Both volumes are obtainable from the Under Secretary, Department of Agriculture and Stock, Brisbane.



Crofton Weed, a Serious Pest.

C. T. WHITE, Government Botanist.

IT has been observed that Crofton weed* is obtaining a hold in south-eastern Queensland. This plant has established itself as a serious weed pest in parts of the Northern Rivers of New South Wales, and is so aggressive, according to some local farmers, as to oust lantana and other strong-growing plants. It may take possession of the soil to the exclusion of grasses and herbage and, if left untouched, eventually ruin a property.

Description.

Crofton weed (Plate 55) is a plant of shrubby growth, usually 4-6 feet high with numerous upright, branching stems. In sheltered situations, such as along creek banks and in scrub, it may be a weed of more straggling habit. The stems are rough to the touch due to a clothing of bristles. The leaves are 2-3 inches long, 1-2 inches broad, and are broadest near the base. They are borne on a slender stalk $\frac{3}{4}$-1 inch long. The flowers are white, arranged in terminal sprays 1-3 inches across, and are of ornamental appearance. The seeds are slender, angular, slightly blackish in colour, except at the apex and very base, and are surmounted by several fine white hairs, by means of which they are carried far and wide by the wind.

Distribution and Common Names.

The plant is a native of southern Mexico and Costa Rica. It favours watercourses or rather wet places on hillsides. It has been established as a weed in eastern Australia for some time. It is sometimes called the Shrubby or Upright Mistflower or Giant Hemp Agrimony.

Properties.

It is not known to possess any poisonous or harmful properties at any stage of its growth. It was probably first introduced into Australia as a garden plant, and became naturalised in gullies about Sydney. Several species of Mistflower are cultivated abroad as florists' flowers.

Eradication.

Grubbing out is the most satisfactory means of dealing with it. No experiments have been carried out in Queensland with regard to sprays, but the plant is of a rather soft nature, and should be amenable to treatment by the ordinary arsenical weed-killing sprays. Because of its perennial underground system several sprayings of the older plants

* Botanical name *Eupatorium adenophorum.*

might be required. The big disadvantage of arsenical sprays is that they are dangerous to use on areas to which stock have access, and stock are often fond of arsenically sprayed weeds which normally they would leave untouched. Chlorate weed-killers are at present unobtainable.

Plate 55.
FLOWERING BRANCH OF CROFTON WEED.

Trees for Farms.

THE Forestry Sub-department has adopted a policy of maintaining stocks of young trees in all nurseries, so that plantation operations at present suspended may be resumed as soon as the war ends. Consequently, considerable quantities of planting stock are available from time to time for distribution to farmers and to the public in general.

For planting as ornamentals, as shade trees or for wind breaks, the following prices apply on rail at sending stations:—

	Per dozen.	Per 100.
	s. d.	*s. d.*
Tubed Plants	5 3	35 0
Open Root Plants	3 6	10 0

Tubed plants are already established in a cylinder of soil enclosed in a metal tube, and the object in planting is not to disturb the soil cylinder. If care is taken, tube planting should give about 100 per cent. survival *at any season of the year*. Spring, however, planting is recommended.

Species supplied in tubes are Hoop Pine, Kauri Pine, Bunya Pine, Cypress Pine (Callitris and Cupressus) and Eucalyptus.

Open root plants are supplied in securely packed bundles with the roots effectively protected from drying out by sphagum moss, soil or some such material. The time for planting open root stock is the winter but, ordinarily, planting should be completed before the end of August or, at the latest, early in September. *Pinus* spp. are supplied as open root seedlings.

Concession for Farmers.

If plants are purchased for planting in forest formation under the following conditions concession rates apply:—

1. Trees are to be planted in plots at least 5 rows deep and must be kept free from brush and other growth.
2. Trees to be ordered in lots of not less than 100.
3. The Forestry Sub-department reserves the right to refuse supply where it is considered that planting would not succeed.
4. Concession price is 5s. per 100 on rail at sending station. For tubed stock, a deposit of 10s. per 100 is required to cover costs of tubes. This deposit is refunded when tubes are returned freight prepaid to the nursery.
5. If conditions are not complied with, the full cost of trees at rates quoted for ornamentals will be payable.

Payments should be made in advance and orders should be placed as early in the year as possible.

Selection of Species.

The Forestry Sub-department is prepared to give advice on receipt of information, including:—

(*a*) Locality;
(*b*) Soil depth, texture and drainage;
(*c*) Original vegetation—species and approx. height attained;
(*d*) Frosting.

The following notes may enable selection to be made by the purchaser.

Hoop Pine, Bunya Pine, and Kauri Pine:—

These species all require good rain forest "scrub" soils to thrive in forest plots. They are frost tender and low lying areas subject to heavy frosting should be avoided. These species are planted 9 feet by 8 feet, which takes 600 to the acre.

Pinus taeda and Pinus caribaea:—

These species are natives of the Southern States of America and are the type planted extensively around Beerwah and Glasshouse Mountains on relatively poor coastal country. *Pinus taeda* requires better soils that does *P. caribaea*. A soil depth of about 2 feet is necessary for good development.

Pinus patula:—

This is a native of Mexico and is planted in the Pechey and Passchendaele districts. It does better than *P. taeda* and *P. caribaea* under conditions of lower rainfall.

Pinus radiata:—

This is the "Insignis" pine. In Queensland it suffers greatly from "die back" and has proved successful only on fair to good soils in the Granite Belt in the vicinity of Stanthorpe.

Spacing for all *Pinus* spp. is 8 feet by 8 feet, which uses 680 per acre.

Eucalyptus spp.:—

In planting Eucalyptus, the evidence of the natural forest may be relied upon. On areas subject to frost the most resistant species are Blue Gum (*E. tereticornis*), Flooded Gum (*E. saligna*), and Grey Ironbark (*E. paniculata*).

ANSWERS.

(Selections from the outward mail of the Government Botanist.)

Cassy.

W.D.G. (Kingaroy)—

Your specimen is from a native shrub commonly called Cassy. It is botanically known as *Acacia Farnesiana*. This plant is very widely distributed and occurs in Mexico, Asia and Australia. In India it is cultivated for the flowers which yield a perfume. It also produces a gum which is used in India. In western parts of the State it is eaten to a considerable extent by stock and is considered to be a good forage shrub. It is not on the list of plants noxious for the State.

Native Dodder.

W.R.S. (Chinchilla)—

The specimen is the native dodder (*Cuscuta australis*). This plant is very cosmopolitan in its hosts, and has been observed attacking a number of different weeds, garden plants and even shrubs. One year it played havoc with the vitex hedges common about Charleville. This is the hedge that people familiarly know out there as saltbush, although, of course, it is not a member of the saltbush family. There is a strong probability that it would attack lucerne if this were in the vicinity.

The plant is a total parasite, not a saprophyte. It contains no green leaves like mistletoe, which is only a partial parasite. It starts life in the ground, but soon leaves the ground and lives entirely on the host plant.

PLANT PROTECTION

Little-leaf in the Custard Apple.

A. A. ROSS, Assistant Research Officer.

A DISORDER which has not been recorded previously has appeared in serious proportions amongst custard apple* trees in the Sunnybank district of south-eastern Queensland. The chief symptoms, which very closely resemble those of little-leaf in the apple, are the cessation of growth on one or more of the leaders and the production of small, mottled leaves which may be followed by a gradual die-back of these leaders from the tip to the point of junction with the trunk.

The earliest symptom to appear is the failure of the terminal shoots to recommence growth in spring following the winter dormancy. Instead of normal growth occurring, small lateral shoots develop at each leaf scar on the previous season's wood, and these fail to grow to a length of more than 2 to 3 inches. They carry a small number of abnormal leaves which are characteristically rigid, narrow, folded upwards, much reduced in size, and mottled in appearance. Typically mottled leaves are bronze-yellow in colour between the veins, while the areas immediately surrounding them retain a certain degree of greenness. These leaves remain attached to the shoots for several months, but do not enlarge beyond about 1 inch in length. They usually fall prematurely in late summer or early autumn, after which the terminals begin to die back. Plate 56 shows an affected terminal and a normal leaf and illustrates the great reduction in size, mottling, and the otherwise abnormal appearance of affected leaves. The length of this particular terminal is approximately 8 inches, whereas the length of a normal terminal of the same age would be in the vicinity of 4 to 5 feet.

If an affected terminal is pruned back, healthy growth is not induced, but, instead, severely dwarfed shoots arise from buds just below the pruning cut. Leaves borne by these shoots are similar to those described above, but are usually even smaller. The internodes of such shoots are very short, and this reduction in length, combined with the rigidity of the small leaves, produces a peculiar type of rosette. The pruning cut does not heal over, and a short, dead stump soon becomes sharply defined from the living tissue below. Plate 57 shows the type of growth which follows the pruning-back of a terminal such as that shown in Plate 56.

Following the little-leaf symptoms described above, a die-back begins at the tips of the terminals, and proceeds down the leaders, which carry these terminals, until the trunk of the tree is reached. In dying back, the young growth shrivels and dries, while the bark further down the leaders exudes a small amount of gum and later cracks. Ultimately, the whole of each leader dies, but it is only in very extreme cases that all the

* *Annona Cherimolia*, Mill.

Plate 56.
Little-leaf in Custard Apple.—Left: Normal leaf. Right: Affected unpruned terminal.

leaders of a tree are affected. Usually only one or two, frequently on the same side of the tree, develop these symptoms thereby upsetting the tree's symmetrical shape. There is no regularity as regards the position of the affected leaders on the tree, those on the sunny side being affected as frequently and as severely as those on the shady side.

This disorder has been observed mainly in young trees up to the age of approximately seven years, while adjacent, older, bearing trees on the same orchards very often have remained apparently unaffected.

Control Measures.

As a result of experimental work, it has been found that trees affected by this disorder in an acute form can be restored to normal health by treatment with zinc. A series of severely-affected trees were sprayed with a zinc sulphate-lime mixture twice during the summer growing period and complete recovery resulted in all treated trees within four months.

while the disorder continued in all untreated trees. The composition of the spray used was 10 lb. of zinc sulphate, 5 lb. of hydrated lime, and 100 gallons of water. Commencement of growth indicated a response to the use of one spray but, on account of heavy rain falling shortly after its application, it was considered advisable to apply a second spray six months later in order to be certain of securing a positive result.

Other methods of applying zinc to the tree have not been investigated in this instance, but it is reasonable to expect that treatments such as spraying with a concentrated zinc sulphate solution during dormancy, the use of zinc pieces driven into the tree, and the injection of solutions containing zinc salts, which have proved successful in remedying little-leaf in the apple, would be effective in the case of the custard apple also.

As spraying is usually the most practicable method of treating affected trees, and as the zinc sulphate-lime spray at the 10-5-100 strength can be applied at any season without injury to the growing tree, it seems most advisable to adopt this treatment in remedying the disorder whenever it occurs.

Plate 57.

LITTLE-LEAF IN CUSTARD APPLE.—Type of growth induced by pruning back affected terminal.

Sclerotinia or Cottony Rot.

F. W. BLACKFORD, Assistant Research Officer.

SCLEROTINIA or cottony rot is a disease which is quite common in Queensland, although it only occasionally reaches serious proportions. It has been recorded from a very wide variety of crops overseas, but so far in this State it has been found attacking only lettuce, cabbage, French bean, passion-fruit, and sunflower.

Symptoms.

The symptoms on the various plants affected have many points in common, the most important of which are briefly discussed in the following sentences. The fungus first attacks the stem at ground level, or any part of the plant in contact with the soil, and a soft, dark, water-soaked rot ensues, which gradually progresses upwards. White, cotton-wool like wefts of the fungus* develop on attacked parts of the plant, and numerous, hard, black, irregularly-shaped resting bodies or sclerotia, varying in size from that of a small pea to a bean seed, are found embedded in these wefts (Plate 58). Attacked tissue breaks down in a watery soft rot.

Passing now to other symptoms which are associated with each individual host plant, it should be noted that on lettuce affected by the

* *Sclerotinia sclerotiorum.*

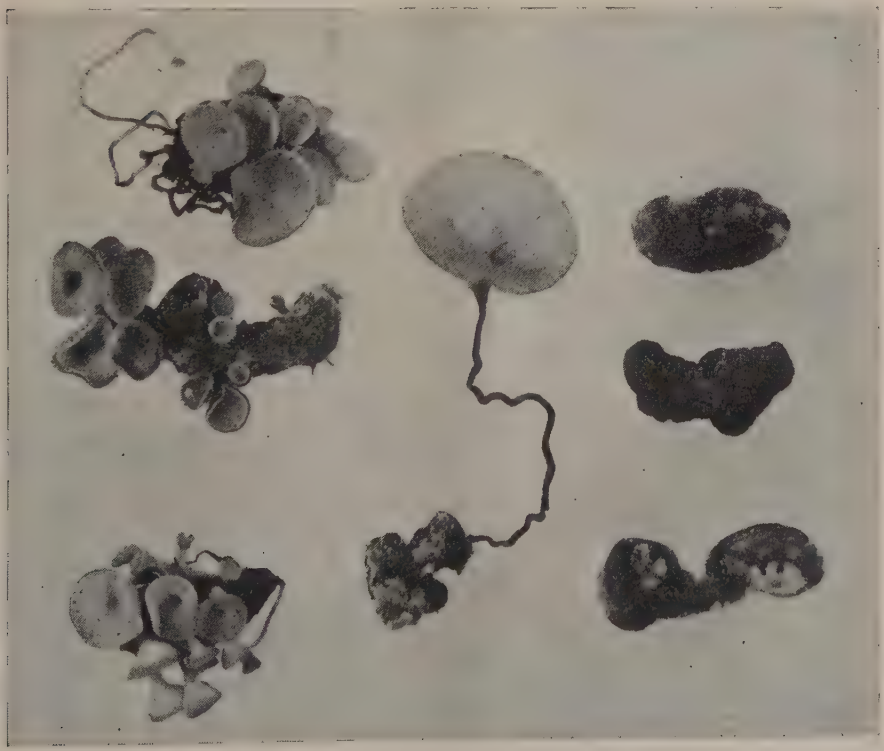


Plate 58.

SCLEROTINIA OR COTTONY ROT.—Left and centre: Mushroom-like fruiting bodies produced by sclerotia. Right: Sclerotia not yet germinated.

disease the lower leaves collapse one by one as the rot progresses up the stem, leaving the heart as a wet mass of decayed leaves (Plate 59). Attacked cabbage bear numerous sclerotia on the rotted surface of the head. In the case of beans the fungus may affect all parts of the plant, the typical wet rot being found on the stem, leaves, and pods alike. The laterals of passion-fruit which touch the ground may be attacked, an infected part at first decaying in the manner typically associated with the disease and finally drying out with the resultant wilting and death of all the rest of the lateral down to the tip. The stems of sunflower are attacked at ground level, the plants wilting and finally dying as the rot progresses and girdles the stem.

Manner of Infection.

The black sclerotia formed by the fungus fall to the ground and become covered with the soil in subsequent cultivation. Given suitable conditions of moisture and temperature they may germinate and produce small, stalked, saucer-shaped, mushroom-like growths (Plate 58), which appear just above the surface of the ground. These bear the spores of the fungus which are forcibly ejected from very minute pores on the upper surface, appearing as a thin cloud of fine dust. The spores are capable of spreading the disease but, as the spore-bearing stage is seldom encountered in Queensland, it is the sclerotia which are more important in this respect. These sclerotia can germinate merely by putting out fungous threads, and these threads are capable of infecting susceptible plants. It is in this manner that sclerotinia or cottony rot infection is generally maintained in Queensland.

Control.

As the sclerotia may remain alive in the soil for long periods, the disease is somewhat difficult to eradicate. Rotation of the land to

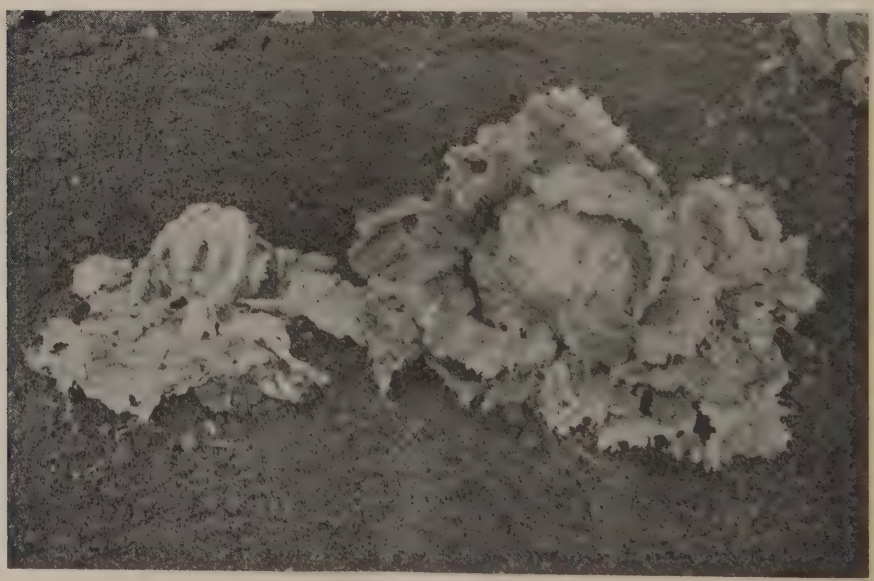


Plate 59.

SCLEROTINIA OR COTTONY ROT.—Left: Affected lettuce plant on which outer leaves have collapsed and heart has rotted. Right: Healthy plant.

resistant crops such as tomato, potato, cucumber, or beetroot would help to reduce the number of sclerotia on land on which a crop had been heavily infected. Wet, badly-drained situations favour the development of the fungus so that the choice of a sunny, well-drained site for the cultivation of susceptible crops should help to keep the disease in check. Well-spaced planting to aid air circulation is another precaution which may be adopted in dealing with this disease.

In a small garden, any diseased plants should be carefully uprooted and burned as soon as infection is detected and, on the completion of harvesting, the soil should be treated with a bluestone solution at the rate of 2 gallons per square yard. This treatment should kill any sclerotia which may be left behind when removing the infected plants. The solution, which is prepared by dissolving 1 lb. of bluestone in 7 gallons of water, should be watered on the soil only after all the plants have been removed, as serious injury will occur if it comes in contact with growing plants. A few weeks should elapse before the treated area is replanted. Any metal utensils—other than copper—which are used as containers for the bluestone solution should be well rinsed with clean water after use; if this is not done they will corrode very quickly.

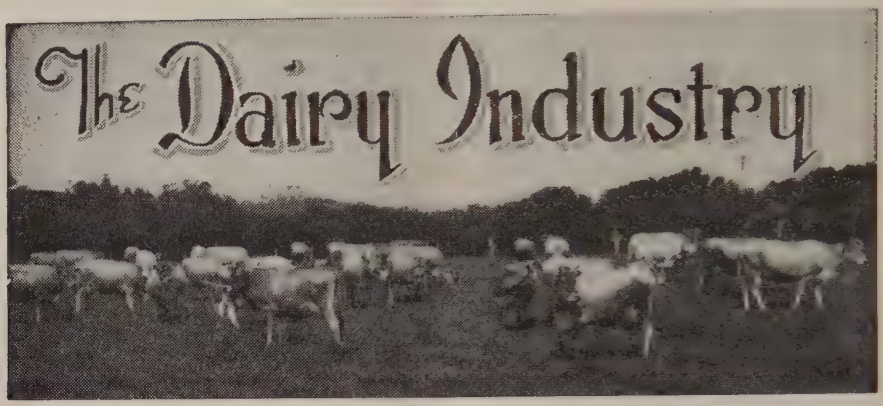
WEED CONTROL IN LUCERNE CROPS.

The intrusion of weeds into lucerne fields is extremely common. Many of these weeds are controllable by mowing and cultivation, but certain grasses and fishweeds are very persistent and difficult to suppress. Grasses usually make their appearance when the lucerne commences to decline after three or four years of high production, or they may invade the field and establish themselves during dry periods when there is very little penetration of rains to the lucerne roots.

One of the most important weeds of lucerne in the Lockyer and on the Darling Downs is woolly-top Rhodes grass. This is a white-headed grass which under mowing flowers close to the ground and sets seed each year. The grass is very evident in infested hay and chaff and lowers the market value of the crop considerably. The best method of controlling this weed is by regular use of the harrows, but complete control is impracticable.

Another fairly common weed in lucerne crops is dodder, which at times causes severe damage to the stand. The dodder seed germinates in the ground, but early in its life the plant severs its connection with the ground and lives entirely on the host plant. This weed can best be eliminated by burning or scorching. Sometimes straw is piled on infested patches of lucerne and fired, but the crop may first be cut and burnt when dry. An effective method of destroying dodder is to scorch the infested patches with a flamethrower, care being taken to treat the stand down to ground level in order to reach all of the stems of the dodder.

When lucerne stands become heavily infested with weeds ordinary control measures are of little use, and ploughing out of the crop, followed by weed-destroying cultural practices, is necessary.



Preparing for Post-War Dairying.

E. B. RICE.

IT must be conceded that dairy farmers are now receiving a more remunerative return for their labours than in pre-war years. While this favourable position continues, every effort should be exerted to ensure that farm efficiency will be raised to a standard which will enable producers to face up to any changed circumstances in the post-war period; in short, the present and immediate future years should be regarded as a buffer period in which to accomplish this objective. In this connection the fundamental factors are (1) quality; and (2) farm efficiency.

Quality.

In the abnormal circumstances of the past few years emphasis necessarily has been more on maintaining production rather than on quality. Although the industry must be credited with having maintained quality under unusual difficulties, this does not justify a complacent attitude. The fact that in pre-war years Australian butter reached the British market not of a uniform quality but as roughly equal quantities of choice and first grades was an initial marketing disadvantage in competing against a uniform quality product from almost every other country. In the eventual renewal of competition with not only the products of other countries but also butter substitutes, quality will undoubtedly assume outstanding importance. The desirable objective of striving to export a uniform quality butter calls for resolute action by every section engaged in an industry, the welfare and stability of which may well depend upon it. Given a cream supply of the requisite quality, the well equipped and technically operated Australian factories are capable of processing it into a high quality butter comparable with the world's best. Therefore, the primary responsibility in the quality drive rests upon the producers. Fortunately, the desired raising of cream quality simply calls for the application in everyday farm practice of the well-known rules of elementary dairy hygiene; it is not a problem the solution of which is intricate or dependent on research. It behoves every individual farmer, therefore, to do his utmost to ensure the achievement of a goal which is well within the range of practicability.

Farm Efficiency.

The urgency for more efficient dairy husbandry is apparent from the relatively low Australian average yearly milk and butterfat production per cow. Efficient production is, after all, economic production. In this connection the chief factors are (*a*) better feeding; (*b*) better breeding; (*c*) herd testing; (*d*) health of stock.

(*a*) *Better Feeding.*—So long as reliance is placed almost entirely on the grazing of pastures for the nutrition of dairy cattle, marked progress in dairying will be retarded. The first and all-important consideration in effecting a rapid raising of the productive standard is the availability at all times of adequate quantities of properly balanced foodstuffs. In some other States, as in Queensland, concentrates have always been in short supply at the time when most needed, and normally (except for farmers supplying the liquid milk trade) too costly in relation to the returns received for dairy produce. It is not meant to imply, however, that supplementary feeding should not be encouraged. It is, in fact, the keynote to better feeding, but the supplementary fodder, especially the roughage, should be produced as far as practicable on the farm. Judicious supplementary feeding is the practical means of arresting the usual decline in production when pastures are inadequate to sustain full milk yield. Farmers who regularly conserve excess growth during periods of abundance of pasture, or grow in the reliable rainfall season crops for conservation as hay, silage or grain, realise the benefits derivable from supplementing the pastures in the drier times of the year. With the intensification of dairying, the practice must become widespread. Likewise, there is ample room in many districts for an extension of the acreage sown with green fodder crops for feeding off in periods in which pasture growth is dormant.

(*b*) *Better Breeding.*—While emphasis is primarily given to the possibilities of feeding in improving the productivity of dairy herds, any progressive policy must also envisage the possibilities of better breeding, herd testing, and health of stock. There is now a general appreciation of the necessity for the use of pure-bred sires for the purpose of grading up ordinary dairy herds, but coupled with better feeding it becomes imperative to use only sires capable of raising the productive capacity of the herd, and thus ensuring the breeding of stock with the inherited capacity for the efficient utilisation of the food consumed. This, in turn, depends upon the systematic testing of the herd for milk and/or butterfat production.

(*c*) *Herd Testing.*—Herd testing provides the only true measure of the productive value of the dairy cow, and the data available must be constructively used in feeding, culling, the selection of breeding stock, and herd replacements.

(*d*) *Health of Stock.*—Finally, and this should hardly require mention, constant vigilance must be exercised with a view to improving the health standard of dairy cattle. The spread of disease in a highly improved dairy herd may, apart altogether from decreasing production, cause serious financial loss to the herd owner. An isolation paddock is an essential not seen on nearly enough farms. A first aid outfit, stock of common veterinary medicines, and pamphlets on common ailments should be kept on every dairy farm.

The Breeding Sow.

E. J. SHELTON.

OF the many tasks which fall to the lot of the farmer engaged in the raising of pigs—pedigreed or otherwise—not the least important is that associated with the selection of breeding stock and their maintenance.

Just what type of stock to select, where to buy reliable, healthy animals, the price to pay, how best to transport them, and, in the case of pedigreed stock, the keeping of breeding records, registration, transfer, organisation of stud sales, are all matters demanding close consideration.

The business is simplified once the type is decided on because the points to be observed in selection are the same whether one or more animals are to be selected.

In selecting the breeding sow, the essential points are:—

Knowledge of ancestry and pedigree,
Development of, or indication of maternal instinct,
Indications of milk production,
Body development, type, constitution, quality.

Invariably it is the strain within the breed to which the greater importance should be attached, for all approved breeds have good points and there are reliable animals within all such breeds.

Modern market requirements necessitate the production of specified types, marketed within a specified range of weights, and in a condition to suit consumer demand, hence the breed of pig—or the cross or grade—has an important bearing on selection. At one time it was thought to be good policy to cross the long, lean Tamworth boar with the short, squat Berkshire sow, but present-day requirements provide no place at all for the short fat breed, whether it be Berkshire, Middle White or either of the American types which were originally developed for quite a different market to the market outlets available to him. In consequence, in bodily conformation breeding stock require to be of similar type even if they are of different breeds. Also, no matter how good the boar may be or how efficient the system of management, unless the breeding sow is capable of producing, suckling, and rearing satisfactory litters, the business of pig production will be a failure, for the breeding sow is the money-maker and the cash return per sow per annum is the ledger item which will make all the difference between profit and loss and which will turn a non-productive business into a profitable one.

Farmers have often been heard to say of their breeding sows, "No, they are not for sale; money would not buy them," thus indicating the paramount value they placed on these animals.

Knowledge of Ancestry.

One of the important points then is to ascertain whether the sow it is proposed to purchase comes from parents of a prolific, easy feeding, profit-making strain, As with the boar, it is not possible to determine these qualities by appearance alone; a reliable guide to inherited qualities is the performance records of the parent stock, and the would-be purchaser should demand of the seller the production of such records whether they be on paper and, or, preferably, to be observed from a close inspection of the stock on the farm.

Many years were spent in educating dairy farmers to the great importance of production records in the dairy herd until to-day the dairy farmer looks or should look for the dam's production record as of prime importance when he goes to select a dairy bull or female foundation stock.

Many pig farmers have not yet developed this technique, but it is becoming more important each year and, in consequence, production records are improving and the business is becoming more profitable.

Pedigree and production records are of the utmost importance and should not be overlooked even if grade or crossbred sows only are to be obtained. It is wise to remember that although individual excellence of an animal itself is highly desirable, it really occupies second place in comparison with the quality and production records of the parent stock.

Pedigree is the permanent record of the breeding of an animal, but is of little value in the absence of reliable records indicating the capacity of the strain to breed true to type and the ability of individual representatives to prove profitable by producing stock of equal or superior merit to those produced by their parents.

With non-pedigreed stock it is essential to study the records which indicate such important features as prolificacy, prepotency, and early maturity. Selection on other lines might result in the purchaser acquiring a really good-looking animal, yet a member of a small and unprofitable litter and perhaps from a slow-growing unproductive strain. The capacity to breed freely, regularly, and abundantly is certainly inherited and is transmitted in no uncertain way. A breeding sow selected from a litter of three pigs cannot be relied on to produce large and satisfactory litters, even though individual animals from such litters may sometimes prove profitable.

Maternal Instinct.

For a sow to be distinctly feminine in type and of a gentle, matronly disposition is obviously important. Usually large bodied sows are better than small bodied animals. The long bodied, light shouldered type is to be preferred to the short dumpy class; coarse masculine types that run to fat and lack maternal instinct are quite useless as breeders. In the course of one's travels one often notices big, burly, "beefy" sows that look as if they would turn up the nose at the job of suckling litters; some, again, are of a cranky, fighting disposition, preferring all the room at the food trough or in the sleeping quarters. These types are a bugbear to the industry, as also are the small, pot-bellied types sometimes seen with litters of three and four, this especially so where the farmer argues the sow is old enough to breed just as soon as she is big enough to take service.

Indications of Milk Production.

The ability of the sow to produce large quantities of rich nourishing milk is inherited just as it is in the case of dairy cows. Many breeders overlook this most important point and select their stock without any reference at all to the milk production capacity. It is a fact that some strains of pigs and some animals within other strains are very poor milkers and lack maternal instinct; they do not produce sufficient milk to satisfactorily nourish their litters. Other strains are noted for ability to milk heavily for a period of two months or more for each litter.

Plate 60.

Length of body is a characteristic much to be desired in brood sow selection. Possibly this sow is a little heavy in the shoulder for a young animal, but within her breed is a good type.

According to overseas authorities, the average daily milk yield for Berkshire, Poland China, and some other brood sows whose breeding was not recorded ranged from 4·9 to 6·3 lb. daily. The average total yield for 84 days, by which time they went dry, was 429 to 532 lb. Some sows gave twice as much milk as others. Much difficulty was experienced in obtaining the sow's milk for purposes of testing or recording, hence these figures must be accepted as a guide only to the productive powers of good quality breeding sows.

In special tests it was shown that sows' milk is richer than cows' milk in all nutrients and especially in fat, for it contains on the average 6·7 per cent. fat. One investigator found the fat globules of cows' milk only one-fourth as large as those of cows' milk, but eight times as numerous.

The commercial value of a litter of pigs at weaning time will be influenced very largely by quantity and quality of the milk produced by the sow, hence the number of teats and development of the sow's udders is of much importance. The number of teats varies from ten or fewer to fourteen or even sixteen. Since each pigling requires its own teat, and will strenuously fight for it, it is essential the sow have from twelve to fourteen teats in order to be able to suckle a corresponding number of pigs. The number of teats should not be fewer than twelve. It is undesirable to retain ten teated sows (or sows with fewer teats) and generally more than fourteen teats is unnecessary, although very long

bodied sows capable of rearing very large litters may have sixteen well-developed teats. The teats should be prominent, evenly spaced and be set well towards the front of the belly. It is suggested those teats nearest to the breast are those which produce the largest flow of milk.

Prolificacy.

Prolificacy should be the constant aim in selection and development of breeding stock. If the average litter can be maintained at 8-10 (or 12) reared, there will be a greater measure of success than if the number reared is fewer than eight. The following summary of litters notified

Plate 61.

Typical Large White sow and litter. It is because of the prolificacy and suitability for bacon production of this breed of pig that it has attained world-wide recognition within the pig industry. Note.—Sow is in good breeding condition, although suckling a large litter. This is the type of brood sow to which the industry must look in the future.

to the National Pig Breeders' Association of England for the year ended 31st December, 1939, and published in the 1940 volume of the National Pig Breeders' Association Herd Books, demonstrate the importance of this characteristic:—

Breed.	No. of Litters Notified.	Average Pigs Born per Litter.	Average Pigs Reared per Litter.	No. of Litters Notified.	Average Pigs Born per Litter.	Average Pigs Reared per Litter.	No. of Litters Notified.	Average Pigs Born per Litter.	Average Pigs Reared per Litter.	
	1939.	1939.	1939.	1938.	1938.	1938.	1937.	1937.	1937.	1936.
Berkshire ..	198	8·38	6·95	242	7·9	6·62	220	7·85	6·37	6·19
Large White	13,513	10·62	8·15	13,620	10·67	8·17	13,324	10·62	8·07	8·06
Middle White	451	9·57	7·37	660	9·72	7·59	679	9·45	7·46	7·6
Tamworth ..	96	7·41	6·34	118	7·95	6·78	94	8·37	6·61	6·45
Wessex Saddleback	1,975	9·83	8·22	1,768	9·86	8·33	1,713	9·91	8·25	8·33

In studying these figures, it is well to remember that the very large number of litters recorded in favour of the Large White might favourably influence the figures in that breed, as against, say, the Tamworth, with fewer litters notified. The figures, however, can be accepted as a reasonably reliable guide of production and rearing averages for sows in these breeds of pigs.

Record Litters.

Although record sized litters are often reported and emphasise again the prolific nature of the breeding sow, extremes are undesirable. There are records of litters varying in numbers from fourteen to twenty-three, but very rarely is it possible for the sow to suckle and rear so many.

The impulse to breed occurs at all seasons of the year and is not a seasonal condition as in the case with animals who bear fewer progeny and come in more occasionally. This period usually develops within ten days of farrowing and recurs every twenty-one days, persisting on each occasion for a period of three days.

The normal breeding life of the sow is five to six years or more; exceptionally good sows have been known to continue breeding up to the age of ten years, but, in general, the sow becomes less profitable each year after reaching six years of age. Thus, commencing at nine to twelve months of age and breeding regularly twice a year the sow should produce up to twelve or fourteen litters in the course of her profitable life after which it is preferable to prepare her for the butcher.

Period of Gestation.

The average period of gestation in the breeding sow is stated by various authorities as four months; or three months three weeks, three days; 112 or 114 days; or 116 to 120 days; or sixteen weeks. The shortest known period is 110 days, and the longest known period is 130 days. No details are available as to the individual records in these cases. (See Gestation Chart, page 171.)

It is apparent from Australian experience that sows having the benefit of succulent and nutritious pasture and plenty of daily exercise in the sunshine in clean pig paddocks where they are undisturbed by other stock, are more likely to farrow satisfactory litters than sows that are continuously housed or held under conditions other than those referred to. But keeping pigs in pig paddocks is only satisfactory where clean, warm, dry shelter sheds are available in which the pigs may camp at night. As the farrowing stage approaches, it also is preferable that each sow be drafted to her own individual yard or pen; this should be done approximately three weeks before the birth of the pigs.

Sows do not always agree when housed together at farrowing time and any disturbance at feeding or at any other time is likely to result in abnormality at birth of the pigs, if not in abortion or other calamity.

Under open air conditions and with succulent grazing there should be little or no necessity for purgative medicines before or after farrowing, but as individuals differ in habits and some sows become very lethargic at this stage, a warm bran mash in which is incorporated three fluid ounces of castor oil and just sufficient table salt to disguise the flavour of the oil will prove beneficial if given two or three days before the birth-date. The use of drastic purgatives should be strictly avoided, as the after effects are liable to bring on irregularities in the digestive organs. In these as in many other matters associated with the management of pigs, it will be found that careful control is a very great advantage and will do more than medicine or force in the obtaining of satisfactory results. The food should be of a laxative nourishing

GESTATION CHART FOR BREEDING SOWS.

The normal period is 114 days; this may roughly be remembered as three months three weeks and three days, or sixteen weeks. Variations of one, two, or three days from this time may occur.

January	Date of Farrowing.	February	Date of Farrowing.	March	Date of Farrowing.	April	Date of Farrowing.	May	Date of Farrowing.	June	Date of Farrowing.	July	Date of Farrowing.	August	Date of Farrowing.	September	Date of Farrowing.	October	Date of Farrowing.	November	Date of Farrowing.	December	Date of Farrowing.
1	24 April	1	25 May	1	22 June	1	23 July	1	22 Aug.	1	22 Sept.	1	22 Oct.	1	22 Nov.	1	23 Dec.	1	22 Jan.	1	22 Feb.	1	24 Mar.
2	25 April	2	26 May	2	23 June	2	24 July	2	23 Aug.	2	23 Sept.	2	23 Oct.	2	23 Nov.	2	24 Dec.	2	23 Jan.	2	23 Feb.	2	25 Mar.
3	26 April	3	27 May	3	24 June	3	25 July	3	24 Aug.	3	24 Sept.	3	24 Oct.	3	24 Nov.	3	25 Dec.	3	24 Jan.	3	24 Feb.	3	26 Mar.
4	27 April	4	28 May	4	25 June	4	26 July	4	25 Aug.	4	25 Sept.	4	25 Oct.	4	25 Nov.	4	26 Dec.	4	25 Jan.	4	25 Feb.	4	27 Mar.
5	28 April	5	29 May	5	26 June	5	27 July	5	26 Aug.	5	26 Sept.	5	26 Oct.	5	26 Nov.	5	27 Dec.	5	26 Jan.	5	26 Feb.	5	28 Mar.
6	29 April	6	30 May	6	27 June	6	28 July	6	27 Aug.	6	27 Sept.	6	27 Oct.	6	27 Nov.	6	28 Dec.	6	27 Jan.	6	27 Feb.	6	29 Mar.
7	30 April	7	31 May	7	28 June	7	29 July	7	28 Aug.	7	28 Sept.	7	28 Oct.	7	28 Nov.	7	29 Dec.	7	28 Jan.	7	28 Feb.	7	30 Mar.
8	1 May	8	1 June	8	29 June	8	30 July	8	29 Aug.	8	29 Sept.	8	29 Oct.	8	29 Nov.	8	30 Dec.	8	29 Jan.	8	1 Mar.	8	31 Mar.
9	2 May	9	2 June	9	30 June	9	31 July	9	30 Aug.	9	30 Sept.	9	30 Oct.	9	30 Nov.	9	31 Dec.	9	30 Jan.	9	2 Mar.	9	1 April
10	3 May	10	3 June	10	1 July	10	1 Aug.	10	31 Aug.	10	1 Oct.	10	31 Oct.	10	1 Dec.	10	1 Jan.	10	31 Jan.	10	3 Mar.	10	2 April
11	4 May	11	4 June	11	2 July	11	2 Aug.	11	1 Sept.	11	2 Oct.	11	1 Nov.	11	2 Dec.	11	2 Jan.	11	1 Feb.	11	4 Mar.	11	3 April
12	5 May	12	5 June	12	3 July	12	3 Aug.	12	2 Sept.	12	3 Oct.	12	2 Nov.	12	3 Dec.	12	3 Jan.	12	2 Feb.	12	5 Mar.	12	4 April
13	6 May	13	6 June	13	4 July	13	4 Aug.	13	3 Sept.	13	4 Oct.	13	3 Nov.	13	4 Dec.	13	4 Jan.	13	3 Feb.	13	6 Mar.	13	5 April
14	7 May	14	7 June	14	5 July	14	5 Aug.	14	4 Sept.	14	5 Oct.	14	4 Nov.	14	5 Dec.	14	5 Jan.	14	4 Feb.	14	7 Mar.	14	6 April
15	8 May	15	8 June	15	6 July	15	6 Aug.	15	5 Sept.	15	6 Oct.	15	5 Nov.	15	6 Dec.	15	6 Jan.	15	5 Feb.	15	8 Mar.	15	7 April
16	9 May	16	9 June	16	7 July	16	7 Aug.	16	6 Sept.	16	7 Oct.	16	6 Nov.	16	7 Dec.	16	7 Jan.	16	6 Feb.	16	9 Mar.	16	8 April
17	10 May	17	10 June	17	8 July	17	8 Aug.	17	7 Sept.	17	8 Oct.	17	7 Nov.	17	8 Dec.	17	8 Jan.	17	7 Feb.	17	10 Mar.	17	9 April
18	11 May	18	11 June	18	9 July	18	9 Aug.	18	8 Sept.	18	9 Oct.	18	8 Nov.	18	9 Dec.	18	9 Jan.	18	8 Feb.	18	11 Mar.	18	10 April
19	12 May	19	12 June	19	10 July	19	10 Aug.	19	9 Sept.	19	10 Oct.	19	9 Nov.	19	10 Dec.	19	10 Jan.	19	9 Feb.	19	12 Mar.	19	11 April
20	13 May	20	13 June	20	11 July	20	11 Aug.	20	10 Sept.	20	11 Oct.	20	10 Nov.	20	11 Dec.	20	11 Jan.	20	10 Feb.	20	13 Mar.	20	12 April
21	14 May	21	14 June	21	12 July	21	12 Aug.	21	11 Sept.	21	12 Oct.	21	11 Nov.	21	12 Dec.	21	12 Jan.	21	11 Feb.	21	14 Mar.	21	13 April
22	15 May	22	15 June	22	13 July	22	13 Aug.	22	12 Sept.	22	13 Oct.	22	12 Nov.	22	13 Dec.	22	13 Jan.	22	12 Feb.	22	15 Mar.	22	14 April
23	16 May	23	16 June	23	14 July	23	14 Aug.	23	13 Sept.	23	14 Oct.	23	13 Nov.	23	14 Dec.	23	14 Jan.	23	13 Feb.	23	16 Mar.	23	15 April
24	17 May	24	17 June	24	15 July	24	15 Aug.	24	14 Sept.	24	15 Oct.	24	14 Nov.	24	15 Dec.	24	15 Jan.	24	14 Feb.	24	17 Mar.	24	16 April
25	18 May	25	18 June	25	16 July	25	16 Aug.	25	15 Sept.	25	16 Oct.	25	15 Nov.	25	16 Dec.	25	16 Jan.	25	15 Feb.	25	18 Mar.	25	17 April
26	19 May	26	19 June	26	17 July	26	17 Aug.	26	16 Sept.	26	17 Oct.	26	16 Nov.	26	17 Dec.	26	17 Jan.	26	16 Feb.	26	19 Mar.	26	18 April
27	20 May	27	20 June	27	18 July	27	18 Aug.	27	17 Sept.	27	18 Oct.	27	17 Nov.	27	18 Dec.	27	18 Jan.	27	17 Feb.	27	20 Mar.	27	19 April
28	21 May	28	21 June	28	19 July	28	19 Aug.	28	18 Sept.	28	19 Oct.	28	18 Nov.	28	19 Dec.	28	19 Jan.	28	18 Feb.	28	21 Mar.	28	20 April
29	22 May	..	..	29	20 July	29	20 Aug.	29	19 Sept.	29	20 Oct.	29	19 Nov.	29	20 Dec.	29	20 Jan.	29	19 Feb.	29	22 Mar.	29	21 April
30	23 May	..	..	30	21 July	30	21 Aug.	30	20 Sept.	30	21 Oct.	30	20 Nov.	30	21 Dec.	30	21 Jan.	30	20 Feb.	30	23 Mar.	30	22 April
31	24 May	..	..	31	22 July	..	..	31	21 Sept.	..	..	31	21 Nov.	31	22 Dec.	..	..	31	21 Feb.	..	..	31	23 April

nature, and quantity should be strictly regulated according to the condition of the sow and litter.

It is unwise to rout in-pig sows with dogs or to force them to jump logs or troughs or to crowd together and rush through narrow openings or under low-set rails. Exposure to extremes of the weather, undue excitement caused by the presence of other sows or the attentions of an over active boar, the use of rough coarse fibrous foods, lack of minerals and succulent green food, lack of drinking water, all have disastrous effects on the progress both of sow and of her litter.

The breeding sow should be normally and regularly exercised. She should be of a docile contented temperament. Any tendency to flightiness is a bad quality, for a vicious sow is not only a danger to her own pigs, but also to children and even those attending to her. Similarly, any tendency to sluggishness or overfatness should be guarded against. Where animals are active and well cared for, they willingly take regular exercise and look and anxiously wait for it. They will maintain themselves in better breeding condition and will not have the tendency to become lethargic and sickly, or to become costive; in fact, constipation is one of the sow's worst ailments at the stage when she is due to farrow and unless promptly corrected is liable to lead to fevers (usually referred to as milk fever) and cessation of milk supply.

Weaning.

Weaning invariably takes place at about 8 weeks of age. In cases where the sow can comfortably suckle her pigs for more than 8 weeks, it will be found to be an advantage to allow sow and suckers to run together for a longer period up to 9 or 10 weeks, even if in the meantime the sow comes in season and is mated.

Size, Conformation and Control.

Bodily conformation is certainly hereditary, that is why certain families within a breed become so popular. Breeding sows should be large, roomy, yet well-proportioned, with wide deep chest, long deep body and well developed hindquarters, otherwise they are unable to allow for the development of large thrifty litters and for their free and easy birth at farrowing time.

This capacity to produce and rear numerous progeny should be encouraged by proper development during the early stages of the animal's life, and by its selection from strains noted for those desirable and necessary qualities. This requires that during the growing stages the animal should be encouraged to grow and stretch out in preference to being fattened, and this can best be done by permitting free range over succulent pastures where the animal will have opportunity of picking up not only green food and mineral elements but will have the benefit of sunshine, exercise and a clean, healthy living environment. Animals appreciate such conditions, and grow and develop to considerably more advantage than is possible under conditions unfavourable to such rapid growth.

Constitution.

The innate bodily strength of an animal and the ability to withstand adverse conditions, together with the capacity to resist disease, is referred to as constitution and as such represents an extremely important point in brood sow selection.

THE BREEDING SOW.

A Striking Contrast in Conformation.

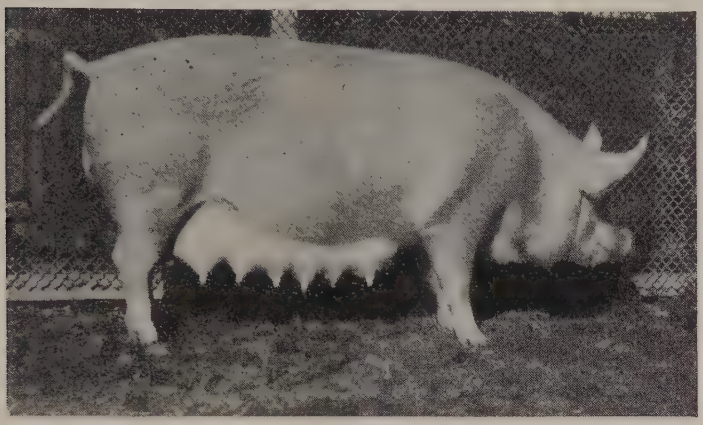
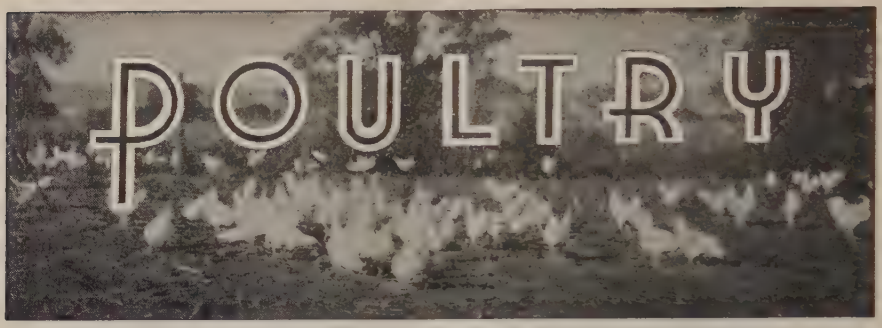


Plate 62.
Large White.

Plate 63.
Berkshire, Canadian Type.

Formerly the Berkshire breed was quite unlike the Large White in type and conformation. The more recently introduced type of Berkshire referred to as of Canadian origin strikingly illustrates the change that has taken place. Both sows were Champions at the same Royal National Show and both show a wonderful capacity for milk production.

The vigour and health of an animal is dependent on its constitution, although it is possible to ruin a good constitution by mismanagement and neglect. In the brood sow a strong vigorous constitution is indicated by a full, broad, deep capacious chest (withal a light shoulder is highly desirable), roomy heart girth, good width between the eyes, ears and forelegs, clean bright eyes, a moist snout, soft, silky, mellow skin and hair, and an attractive healthy action. Pigs need to be strong and healthy if they are to prove profitable, and it is important that all the features mentioned should be given due appreciation when selecting the breeding sow.



Marketing Eggs.

L. R. JESSER, Poultry Inspector.

EFFICIENCY in egg production is of little use unless the same degree of effectiveness is extended to marketing. The quantity of eggs marketed at less than top values, because of lack of quality, indicates definitely that all the necessary care has not been extended to the marketing of the commodity. The loss sustained by the individual in the marketing of second-quality eggs is from 12 to 15 per cent.

Protecting Egg Quality.

As the loss caused by deterioration in quality can be so great, it will be readily understood that everything should be done to prevent this deterioration. The producer should not lose sight of the fact that the hen provides a highly nutritious food in a convenient form, wrapped and sealed within a shell, although of a highly perishable nature.

The poultry-raiser has three principal factors to consider in the protection of egg quality—

Fertile eggs.
Soiled eggs.
Effect of heat on the egg.

Other influences which affect quality and to which eggs may be exposed are moulds and bacteria. These influences, however, are not common where the best possible conditions for production have been established.

The production of fertile eggs should be avoided as far as possible. Although incubators are operated at a temperature of 100 deg. Fahr., it does not need a similar temperature to commence the development of the germ, and in the height of summer it is almost impossible on many farms to keep eggs at a sufficiently low temperature to prevent some form of cell division developing in fertile eggs; and once embryonic development has advanced to any degree and stops, decomposition soon follows. In these circumstances, roosters should not be allowed to run with the flock, excepting during the period when breeding is necessary.

The next condition to guard against is the soiling of eggs in the nests. Naturally, an ample number of clean nests, sufficiently roomy, should be provided. In these nests it is essential to have some form of material to make the nest comfortable and attractive to the bird, to

protect the egg from being broken, and to protect the egg, as far as possible, from becoming soiled. Many egg producers use old butter boxes for nests. These, in size, are very suitable, and in planning any form of nests, the butter box could be used as a guide for size. The main factor is to make nests so that they are easily kept clean, and of material which is free from odours, as eggs, like milk, readily absorb taints.

Various forms of nesting material may be used, such as straw, shavings, sawdust, sand, and shell-grit. Shavings and sawdust because of their fineness are more absorbent and are not scratched out of the nest to the same extent as straw; they also have a greater cleansing effect on the feet of the birds, thereby preventing, to some extent, the soiling of the eggs. If sawdust or shavings are used, pinewood residue should be chosen, as many of our hardwood sawdusts have a staining effect on the shell of the egg. Shell-grit is a reasonably good nesting material, naturally not so absorbent as sawdust, but usually too expensive in many districts for extensive use. Sand is much like shell-grit, but many particles become attached to the moist gelatinous coating of the egg when it is laid, and they are most difficult to remove without washing.

To provide suitable nests and nesting material, however, is not enough. The frequency with which eggs are gathered has a very marked effect on their cleanliness, and, more than that, upon the labour entailed in preparing the eggs for market. Three gatherings a day is a sound practice, particularly when production is at its height and several birds are visiting each nest daily. When production is slack, the gathering of eggs may be reduced to twice daily. Not only does the frequency with which eggs are gathered assist in keeping the eggs clean; it also protects them against breakages, and the possible development of the vice of egg-eating.

Effect of Heat.

The egg, when manufactured, is full. On cooling, separation occurs between the two membranes within the shell of the egg, and a small air cell is formed. Heat hastens the evaporation of the moisture contained in the egg, enlarging that air cell.

The albumen also becomes thinner, and the yolk more visible on candling, and instead of being retained in a more or less central position of the egg, becomes "sided," and at times attached to the shell. When this type of egg is broken for poaching or frying, the yolk is flatter, not standing up like a new-laid egg, or an egg which has not been subjected to heat, and the albumen being thin, spreads—conditions which the consumer does not appreciate. It does not require a very high temperature to cause this breaking down, and it has been found that a temperature over 60 deg. Fahr. is conducive to rapid deterioration of quality. In fact, temperatures of 68 deg. Fahr. have been known to stimulate embryonic development; therefore the coolest position on the farm should be sought for the storage of eggs pending transport to market. Further protection of the egg against excessive heat is given by frequent gatherings, as it prevents their being re-heated by the visits of other birds to the nests.

Eggs should be gathered in 2-gallon buckets with rigid sides. A bucket of this capacity will hold from 100 to 120 eggs, the bulk of which is conducive to the rapid loss of animal heat when placed in a cool place.

Nests should be placed in positions which are not exposed to the sun. For this reason, nests extending in front of the poultry sheds are not recommended as most suitable for the preservation of quality. During transit to market, cases of eggs should also receive some protection.

The storage of eggs on the farm pending transport to market is most important. Eggs should be held in a room which is as uniform in temperature as practicable—one between 40 deg. and 60 deg. Fahr. would be just right. The room should be free from odours and have good ventilation. If the air is dry, humidity may be increased by setting pans of water about the room, or sprinkling the floor. Excessive moisture, indicated by condensation, should, however, be avoided. If such a room is not available, the egg-cooling and humidifying cabinet illustrated (see Plate 64) will serve a useful purpose in providing cooling and humidifying facilities.

Packing.

The practice of using chaff and similar material for packing has, happily, largely ceased, and the use of standard case and fillers adopted. Many producers, however, with the object of giving greater protection to the egg, use chaff and material of a like nature in the bottom and frequently the top of the cases. This is not recommended. As well as causing the eggs to become dusty in appearance, the practice exposes the eggs to infection by moulds. If it is at all necessary to use anything to take up the slack in the case, crumpled paper is preferable.

The standard 30-dozen case, as now used by the Queensland Egg Board, obviates the necessity for any further protection, and is recommended to all producers as the best to use.

Adherence to the following rules will largely govern the production of quality eggs:—

1. Breed only from birds that produce eggs of satisfactory size and shape and good-quality shell.
2. Provide only wholesome food, including shell grit, and fresh water. Remember that yolk colour is improved by the feeding of green feed and yellow maize.
3. Produce infertile eggs for market. Fertile eggs may quickly decay because of partial embryonic development.
4. Provide at least one nest and nesting material for each five layers. Keep the nests dry and protected from the sun.
5. Do not allow broody hens to occupy nests. They heat up the eggs.
6. Gather eggs thrice daily in summer, and twice in winter, in a clean bucket, and stand in a cool place until animal heat is lost before packing.
7. Do not wash eggs unless absolutely necessary to make them completely clean. Aim at keeping them clean by good management.
8. Keep eggs until marketed in a cool, clean room, free from odours.
9. Market eggs at least twice weekly, protecting them from the sun during transit.
10. Use only standard cases and fillers for packing.

An Egg Cabinet.

Following are particulars of a satisfactory egg cabinet for use where a cool storage room is not available:—

Capacity.—Bottom shelf: Quantity of egg buckets or wire baskets. Middle shelf: Three 30-dozen cases of eggs. Top shelf: Three 30-dozen cases of eggs or three 30-dozen empties for cooling.

A HOME-MADE EGG COOLING CABINET.

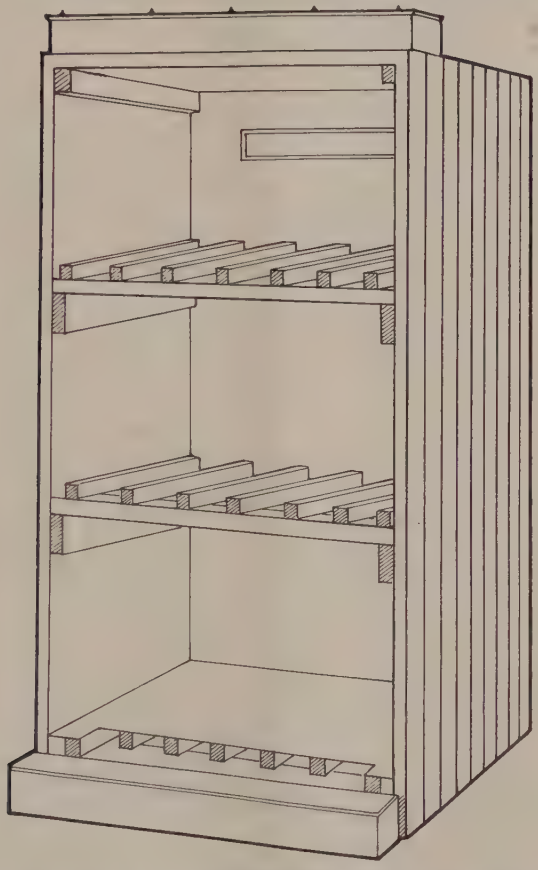


Plate 64.

A Frontal View with Bag Curtain Removed, showing Open-slatted Top and Middle Shelves, with Ventilation Hole in Top of Back Wall, and Cut Out in Fibrolite, Slide-in, Bottom Shelf Cover.

Curtain.—Two thicknesses of jute sacking quilted together, 45 inches wide and 80 inches in length. This carries water from the top to the bottom water pan. It covers the whole cabinet front and serves as a wick and as an evaporation surface. This curtain should be frequently washed.

Water Pans.—Two heavily galvanised pans 4 inches deep, 6 inches wide, and 45 inches long. One rests on the top front of the cabinet and is kept filled with cool, clean water. It has five or six slender pegs on

its upper front edge to prevent the water-soaked curtain from slipping, and two small lugs at back to screw on to top of cabinet. The other pan rests on floor and receives the drip from the curtain.

Dimensions.—To accommodate three 30-dozen cases on each shelf the over-all measurements are—

Height, 70 inches.

Width, 45 inches.

Depth, 29 inches.

Materials Required.—

Back wall, side wall, and top, 4 by 1 V.J. pine.

Bearers for shelves, 2½ by 1½ D. pine.

Ledges under bearers, 3 by 1 D. pine.

Shelf joists, 1½ by 1½ D. pine.

Fibrolite or other insulating material for lining of sides and back, and loose slide-in floor.

THE FEEDING OF FOWLS.

Poultry-raisers as a whole have a very fair idea of the principles and practice of feeding, and take into consideration factors which make for efficient and economic production.

The present-day values of cereals may induce some to depart from old and accepted practices in order to reduce costs. There are three points, however, that must not be lost sight of, if the best results are to be obtained and the general health of the stock maintained—viz., the vitamin content of the ration, the protein content, and the quantity supplied.

Vitamins.—Vitamin A is of outstanding importance at the present juncture, for a shortage in the ration may cause outbreaks of nutritional roup as well as lowered egg production. The feeding of yellow maize and green feed ensures a sufficient supply of this vitamin. The price of maize will, however, preclude its inclusion in the ration to the same extent as in past years. Wheat will be used to replace this cereal, and so one source of vitamin A is lost.

On most poultry farms during the winter months green feed is not plentiful: consequently under normal circumstances the loss due to a shortage of maize cannot be overcome. It is therefore of paramount importance that the poultry-raiser should make a special effort to supply the birds with good succulent green feed. Green feed is the cheapest form in which the birds' requirement of this vitamin can be supplied. In cases where home-grown feed cannot be obtained, poultry-raisers should use at least 10 per cent. of good green lucerne chaff or meal in the mash fed to their birds.

Protein.—To obtain the maximum economic production, laying birds should have in their ration (i.e., grain and mash) a total of approximately 15 per cent. of crude protein. Maize has about 10 per cent. and wheat about 13 per cent. of protein. Where maize has been used extensively and is replaced with wheat it may be desirable to reduce slightly the protein content of the ration. This is most easily brought about by a slight reduction in the meat meal fed.

Generally speaking, however, the protein-rich meat meal is not overfed, and its greater use is advisable in certain circumstances. This is particularly so in the case of the poultry-raiser who feeds extensive quantities of skim milk to his birds. With the approach of winter the milk supply will probably diminish. In such cases the loss of protein of animal origin in the form of milk should be supplemented with meat meal.

Quantity.—Providing the right kind of food is being used, economic production is only possible by feeding the birds all they will consume. Do not be afraid of making your birds unduly fat. The good producer will convert the food supplied in excess of body requirements into eggs. Birds which cannot do this should be culled and sold for table purposes.

FARM ECONOMICS

Farming Efficiency.

C. H. DEFRIES.

EFFICIENCY may be thought of in terms of yield per acre, output per unit of labour, income per unit of labour or return per unit of capital according to the particular problem in mind, but the central point to emphasise in respect of the individual farm is that maximum economic production can only be achieved if every practicable means is used to avoid waste and misdirected effort not only of materials and power, but also of human labour. The present object is to direct attention to some aspects of the economic use of farm resources, and in particular to the application of what is called the law of diminishing extra returns. By thinking along the lines suggested the essential nature of the problem of attaining maximum output consistent with economic production may, it is hoped, become clearer and so assist farmers to achieve this aim.

The Economic Problem.

It is as well to realise at the outset that whenever an effort is made to attain definite ends with scarce means, whether in farming or any other human activity, there is a sense in which it can be said that an economic problem is involved. The goal at which the farmer aims can be broadly described as economic production. As everyone knows, the means—labour, power, equipment, and materials used on the farm—are scarce enough. The term scarce does not, however, refer merely to physical shortage as such but rather to the fact that the means have alternative uses to which they can be put, and that there is insufficient of them to supply fully all the various demands that are made of them.

For instance, the tractor used on the farm could also be used for making roads; some of the materials used in making the tractor could have been used in making an army tank or a truck. Similarly, the tractor can be used to plough land for a crop of wheat or oats, potatoes or corn, fodder crop or grain crop, and so on; examples could be multiplied without end. From these alternatives there arises the economic problem of some choice as to the allocation of the means of production among various ways of using them.

Therefore, whenever a farmer uses labour or machinery for one purpose rather than another, there is implied some prior decision made that this should be done. The whole basis of farm planning rests on an examination of the reasons for arriving at such decisions. Obviously, the decision may have resulted simply as a result of the farmer being in the habit of doing one thing rather than another, this may or may not be desirable; it would depend on whether or no the habit is based on experience and sound judgments made some time in the past. The decision may result from following rule of thumb methods not so

soundly based; or there may have been some prior deliberation and thought. Under prevailing conditions, there are obvious grounds for believing the most desirable attitude to be the lastmentioned, but before considering some of the basic elements of this type of problem, it might be as well to examine some of the peculiarities of farming which modify the cut and dried sort of efficiency planning attained in, say, a manufacturing establishment.

The Nature of Farming.

The first striking feature about farming as an industry is the lack of control possessed by the individual over the forces that are used by him in the process of production. Unlike the manufacturer, the farmer is unable to say with absolute precision what tasks he or his employees will be engaged on the following day or the following week. His future actions are largely influenced by the weather or other unpredictable natural forces which can upset any carefully laid plans. His intention to plough to-morrow may easily be changed by rain; there is no knowing in advance the exact number of times it will be necessary to cultivate land in preparation for the coming crop. The tractor might have to be used for ploughing at the same time as it is needed for scarifying on inter-row cultivation and horses have to be used instead. It is clear then that planning on the farm has to be flexible in order to meet the requirements of varying natural conditions.

Secondly, notice has to be taken of the interdependence of the different sections of the farm. The pattern of organisation existing at any time is influenced by a number of different factors, such as the climate, soil, topography, market and economic conditions, the preference of the farmer, and so on; the working out of the most suitable farming system under any given conditions is a complex study in itself, but to the practical farmer it is obvious that his crop and his stock enterprises are very closely linked together. A vivid example of this is the control of weeds by sheep on a wheat farm. Again, the way one crop prepares for another may be noted—as on the Burdekin Delta where the winter potato crop leaves the soil in excellent condition for late-planted sugar-cane. It might be decided that the best way of utilising farm labour is to ensure that the demand of the various farm enterprises for labour is uniform throughout the year. That is, to make sure that the requirements of all the various crops and stock kept on the farm are complementary one to the other, instead of all competing for labour at the same time. In an area such as, for example, North Queensland, where seasonal conditions throughout the summer months preclude much activity on the land and where most production is concentrated into winter months, this has obvious limitations.

This is a most interesting and helpful aspect of farm economics, but at this stage it is sufficient to say that the second feature of farm planning worth emphasising is the necessity for full awareness of the limited alternatives that are available to the farmer. The whole system of farming cannot be adjusted except for the most drastic reasons and every change made has to be analysed to find out how other portions of the farm will be affected.

Considerations such as these are frequently sufficient to discourage any attempts to improve efficiency. A more balanced outlook would recognize that while farming is to a large extent an "art," the modifications imposed by the conditions under which farming is carried on do not eliminate the necessity for taking into consideration either

the scientific aspects of farming technique, or the economic aspects of the farm business. Only if all three aspects of the farm are given their due place in a balanced attitude can something be done to supplant rule of thumb methods which may hinder efficient production.

The Law of Diminishing Extra Returns.

One of the most important ideas it is desirable to grasp in respect of farm efficiency, and the allocation of the factors of production among the various available alternatives, is that of the law of diminishing extra returns. The essence of this law is that in the production of foodstuffs there is a point in the application of capital beyond which the extra returns gained from the application of each additional unit of capital tend to decline. It is a very important tendency in agricultural economics and has widespread application, but it will be sufficient here to refer to it only insofar as it affects the farmers' immediate production problems.

Use of Fertilizer—An Example.

The tendency to diminishing extra returns is most effectively illustrated by thinking of the application of fertilizer to a crop. If the tendency did not exist, it would be possible by applying more and more fertilizer to a given piece of land to keep on increasing the yield of crops as the population increases without having recourse to new land. In terms of the history of the last 100 years, this would have meant that the lands of the new world would not have been required to feed the population of Europe during the stage of its industrial expansion. On the contrary, the course of events is that as the population expanded in Europe more and more of the lands of the new world were required for food production.

When fertilizer is applied to a crop the extra returns from each succeeding application might at first increase—this is the stage of increasing extra returns—but very soon these extra increments of yield begin to grow smaller even though the yield itself increases; the extra increase, in other words, is less than proportional to the additional quantities of fertilizer added.

This is the stage of diminishing extra return. It means that every extra hundredweight of fertilizer given to a crop gives an increase in yield up to a point, but each increase is less than the one immediately preceding it. If we think of more and more fertilizer being applied, it is easy to see that ultimately we shall get to a point when the yield itself will begin to decline. Therefore, it does not pay to add unlimited fertilizer to crops; and one of the objects of fertilizer trials is to determine what are the limits of economical application. That is one important reason why all farmers should take a keen interest in this type of work.

Two Main Farming Problems.

The two main types of problems in the solution of which an appreciation of the law of diminishing extra returns might be of some help to a farmer are—

(1) To determine how intensely a certain area of land should be cultivated.

(2) To determine the area over which the farm resources should be spread.

In actual fact, these are two ways of looking at the same problem, but it is with this duality that they strike the farmer. The first when

he is thinking in terms of how much fertilizer is to be applied per acre for optimum results or how much seed potatoes is to be planted per acre, or how many times corn is to be cultivated, and so on. The assumption is that it is possible to buy the amount of fertilizer decided upon and to engage the labour and the power required for cultivation. On most farms to-day, however, the farmer has a slightly different angle on the matter. He is mainly concerned to decide over what area of land he should spread his available resources. Many of these might be a fixed quantity. He may be able to buy enough seed potatoes to plant any area he wants to establish at any rate he decides on; but there are many factors, such as labour and power, of which the quantities available cannot be increased to any extent, particularly at short notice. Nevertheless, this fixed amount of labour and so on can be applied to an acreage that it is possible to adjust to an appreciable extent. In effect, the labour might be static, but the acreage of land on the farm might not be fully used. It is then, perhaps, a question of deciding whether to plant a large area and allow the standard of cultivation to fall or to concentrate on a small area, and farm more intensively. This is particularly relevant to present conditions, as there is a tendency, for which there is some justification, to establish the maximum possible area of a crop according to some more or less reasonable standard of culture that it is thought will pull the crop through; then to trust to luck that the weather and a happy combination of circumstances will be kind enough to overcome any difficulties in attaining the standard of cultivation the farmer has set himself. Difficulties which may arise, because of a misjudgment of labour requirements, are breakdown in machinery, unfavourable weather conditions, and so on. The prevailing tendency to attempt too much is probably to be preferred to the opposite course, but it is just as well to keep in mind that it can be overdone. There is no advantage in trying to cultivate more than can be handled economically by existing resources. The aim should always be maximum output with the least possible input.

Balanced Cropping.

In the application of the law of diminishing extra returns to the farm business, the farmer will find that if he makes sure to utilize the factors of production which are not being taken away from other production on his farm in such a way as to ensure that the value of the increased return is greater than the cost of the extra applications, allowing for reasonable contingencies, he will not go far wrong. The main thing to understand is that it is the latter portion of a high-yielding crop which costs the most; that it is the last few pounds of meat on the beast which takes the most feed; that it is the last few pounds of butter which are the most difficult to obtain; in other words, that high yields *might* mean efficient technique but poor economy. It would obviously depend, among other things, on the prices of the product. The higher the price, the more a farmer can afford to cultivate intensely and the more economical it is to do so.

Extra Returns—And Extra Cost.

The necessity for watching that the value of extra returns is greater than the extra costs incurred is quite easy to grasp, notwithstanding that it is sometimes forgotten. Far more difficult is the position that arises when extra applications of labour, machinery or capital can only be given at the expense of some other enterprise on

the farm. In such a case, the foregoing formula would not apply. In enterprise A, the farmer might utilize more labour than his present practice allows for and still make a profit over the extra cost; but in order to do so he might have to draw the labour from enterprise B. The question arises then: Which is the more profitable use to which the labour can be put, in enterprise A or in enterprise B? To provide adequate quantitative data for precise judgments on problems such as this, there would need to be fairly comprehensive research into the input and output relationships of the various crop and stock enterprises. Such research would fix the levels of the most profitable intensity of culture under various conditions.

Value of Farm Records.

In the absence of the help that would be obtained from such studies, the farmer has to be guided by his own experience and observation. The value of farm records and records of average performances of men and machinery in the district showing the results which might be attained from different degrees of intensity of culture is obvious, and would be a very useful guide for problems of this nature. In the meantime, at least it can be said that thinking along these lines is well worth while. An appreciation of the operation of the law of diminishing extra returns does help to provide a corrective influence to the tendency to trust too much to luck and good fortune, even if its application can only be rough and ready at the present stage in our knowledge of the economics of farm production.

Summary.

The lessons which the law of diminishing extra returns have to offer are:—

(1) Maintain contact with the latest results of technical research in whatever branch of farming a farmer may be interested.

(2) Always use whatever information and experience is available to ensure that extra costs incurred are covered by the extra returns obtained.

(3) For any given conditions of price, skill and production technique, there is an optimum intensity of culture that is the ideal to be aimed at. In other words, there is an optimum amount of land that should be used with a certain amount of other factors of production.

(4) That over much diversification of effort might defeat its own object if it results in inability to apply specialized knowledge most effectively, or in having a lot of capital tied up in machinery which cannot be put to full use, or in having too much lost time as a result of breaking off and starting different jobs.

Perhaps efficiency is not the be all and end all of farm life, but in these strenuous days every little that the farmer can do towards the more economic utilization of resources helps the food problem. There are many ways in which a little effort will prevent waste—making sure that seed has a good germination to avoid wasted effort in planting; sparing a few minutes every day for the greasing, oiling and maintenance of machinery will yield definitely increased extra returns; reducing the number of turns for the tractor and implements to a minimum by adjusting the way paddocks are planted; keeping all cutting edges sharp; these are all ways in which labour and other effort can be reduced. Above all, it is always wise to keep mentally alert to the opportunities for more effective performance not only of physical operations but also of the tasks of management.

The Best Time to Plant Cotton.

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

THE results obtained in investigations and in commercial plantings generally in the districts south of Mackay indicate that the best time to plant cotton is roughly from late September to mid-October in the Central district and from mid-October to mid-November in the areas south of this district. Some modification of these generalisations may be required, however, according to the type of soil on which cotton will be grown and the variety of cotton planted.

Generally speaking, the best results can be expected from rain-grown cotton in districts where this crop is grown on land that has not been cultivated more than three years following a pasture of either native grasses or Rhodes grass. There is a better balance of the plant foods required by cotton in such cultivations, than usually exists in old cultivations, particularly those on fertile alluvials or on soils originally under softwood scrub. Consequently, there is less tendency for cotton grown during the first three seasons after grassland to make the rank growth of plant that frequently occurs on the fertile old cultivations. This lesser tendency to make rank growth on the newer cultivations allows of a wider range of times of planting than those indicated above, producing satisfactory yields, particularly when suitable quick-maturing varieties are planted. It is undoubtedly advisable, however, to plant in the indicated periods, if at all possible.

Where is is not possible to grow cotton following grassland, it is strongly recommended that everything practicable be done to provide a good supply of subsoil moisture and to enable the planting of the cotton being done after the first suitable rain experienced in the above recommended periods. This particularly applies to fertile alluvial soils where there is always a danger of rank growth developing in late-planted crops if very wet conditions prevail during the first part of the "wet" season. This danger also applies to crops that will be grown with supplementary irrigation. Most of such plantings will be on fertile alluvial soils and it is highly advisable to apply the pre-planting irrigation in time to plant by mid-October.

No advantage appears to be obtained under normal spring conditions by planting in August or even early September. While the day temperatures may be satisfactory, the night temperatures during these periods are usually so low as to retard both germination and the early growth of the resultant seedlings. Consequently, plantings made in these periods may yield less satisfactorily than plantings made in late September or early October, for the latter may produce a better stand of fast-growing seedlings than is normally true of earlier plantings.

In some seasons a very heavy loss of terminals may occur through insect attacks in the plantings made in August and September, especially when planting is done on an isolated storm providing just enough moisture to enable a stand to be obtained and barely maintained. Under such conditions, if further rain is not experienced within a fortnight, little green growth persists other than the cotton seedlings. Various insect pests may, therefore, concentrate on the early plantings of cotton with a resultant destruction that may involve up to nearly 100 per cent. of the terminals as well as many of the seedlings. If good, heavy rains occur at planting time or soon after where planting is done following a light storm, the danger of seedling damage does not appear to be so great because the plants quickly outgrow the dangerous period for insect attacks.

It may be advisable, therefore, if a good soaking rain occurs about mid-September in the Central district or during the latter part of that month in the districts south thereof to plant after this rain, particularly if there is sufficient subsoil moisture to maintain the resultant seedlings for an extensive period. Undoubtedly, when the crop gets off to an early start under conditions conducive to the plants making satisfactory development, the prospects of producing a profitable crop are greatly enhanced. This was demonstrated in the 1943-44 season at the Biloela Research Station, when plantings made on the 8th September on land which had been in Rhodes grass for three seasons and was ploughed in March to conserve the subsoil moisture resulting from the summer rains yielded 1,131 lb. seed cotton per acre, compared with 812 lb. produced by adjacent plantings on the 6th October. Plant examinations at the end of January following three weeks of very hot, dry weather indicated that, although severe shedding of squares and young bolls had occurred in both times of planting, the bolls in the September-planted crop were appreciably larger than in the October planting. Apparently the earlier squaring and flowering in the earlier planting had allowed many of the resultant bolls to develop normally before the onset of the stress conditions.

The production of larger bolls in the earlier plantings may not only improve yields but may also enable better picking tallies to be obtained than is possible when the bolls are reduced in size by adverse conditions. It is pointed out, however, that the early setting of a heavy crop in the early plantings may adversely affect the development of the crop during prolonged dry weather experienced at mid-season, unless there is a good supply of subsoil moisture to assist the plants to withstand such conditions long enough to mature a satisfactory portion of their crop.

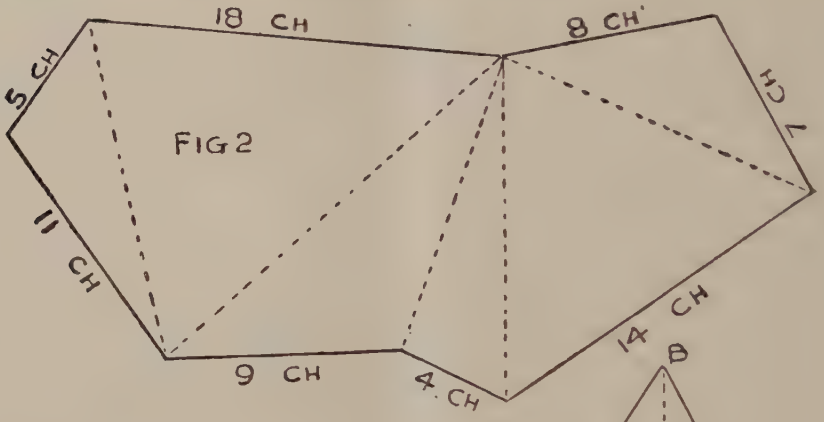
Summary.

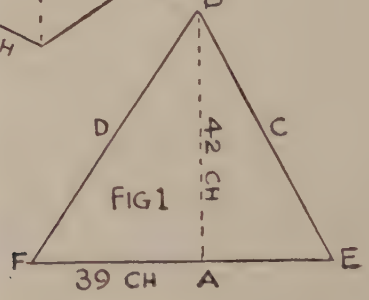
The best time to plant cotton in the areas south of Mackay is from late September to mid-October in the Central district and from mid-October to mid-November in the districts south of that area. Where cotton is planted during the first three seasons following grassland, slightly later plantings can normally be expected to produce reasonably satisfactory yields, particularly when suitable quick-maturing varieties are grown. Where cotton is to be grown on old fertile alluvial cultivations, either with or without the assistance of supplementary irrigation, it is definitely advisable to plant around mid-October if at all practicable. Later plantings on such soils may make rank plant growth if very wet weather is experienced in the early part of the regular wet season, and, as a result of such growth, may suffer a severe loss of crop through either following stress conditions or insect pest attacks, or both.

GADGETS AND WRINKLES

MEASURING IRREGULAR PADDOCKS.

To find area of paddock with several sides of unequal length, the first step necessary is to divide the paddock into convenient triangles. Multiply the base of each triangle by altitude and divide the product by 2. Repeat the process for each triangle

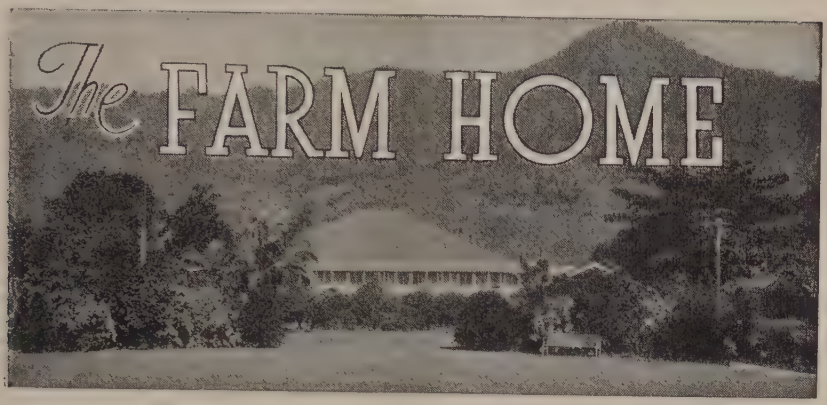




and add totals together. Any side of triangle may be called the base. Altitude is the shortest distance between the base and highest point of triangle. In Fig. 1, F E is taken as the base. The shortest distance from F-E to B is from point A, a distance of 42 chains. Thus length of the base—59 chains—must be multiplied by the altitude—42 chains, and product—2,478—divided by 2 gives the area of the triangle as 1,239 square chains. Thus the acreage is 123 acres 9 square chains. Working is as follows:—

$$\frac{59}{1} \times \frac{42}{1} \times \frac{1}{2} = \frac{2,478}{2} = 1,239 \text{ square chains.}$$

If desired, F-B could have been taken as base. In this case the altitude would have been from point D to E. Or if side B-E had been called base, altitude would have been from point C to F. Fig. 2 shows how triangles are determined.



Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE CARE OF THE BABY'S SKIN.

NO matter how large or how small the baby may be on arrival, his body will be entirely covered with skin. This covering is in infancy extremely delicate and easily injured and must therefore be handled with great care. The skin has two very important functions—one is to protect the body, and the other to assist the body to throw off waste materials. It will be readily seen that only when the baby's skin is whole is the body safe, because if it should become broken some harmful germs may slip in and set up a local infection or even enter the blood stream and poison the baby's system.

When the baby is born his skin is covered with a protective layer of grease, and this is usually removed with oil soon after birth. Unless the baby is premature or otherwise weakly, he is soon introduced to his first bath which is given with warm water and soap. Soaps which contain a large amount of soda or are highly perfumed should not be used—an olive oil soap, such as castille, is probably the best.

Do not forget that the skin breathes. It is filled with minute pores from which is given off perspiration. Daily baths are needed regardless of the time of the year, in order that the skin may be cleared of perspiration and lifeless skin cells and given a chance to breathe properly.

A mother with a first baby is often afraid of bath time because she is unused to handling such a small wriggling scrap of humanity, and if she did not receive proper instruction in this procedure before her baby came along she should ask her nurse to allow her to bath the baby under supervision so that she will not be nervous when left to do it by herself. It is advisable to give the bath at the same time each day, and it should be arranged a little while before a feed is due, certainly not within an hour after a feed.

The mother should have everything in readiness before undressing the baby, because the bath must not be too prolonged, as the baby's large skin surface causes him to chill easily. Choose a place sheltered from draughts, and in winter, if a warm sunny room is not available, some artificial heating will be required. In the summer a sunny corner of the verandah may be used, as the sun on the baby's skin is good, but even in warm weather he should be screened from direct draughts. The very young baby usually cries vigorously while being bathed, but after a few weeks, if the mother handles him well, he learns to enjoy his bath.

The drying after the bath is most important in the care of the baby's skin and must be very carefully done. Pay special attention to creases and folds of skin and also to the backs of the ears. If left damp these places are apt to become

sore. The application of powder should never take the place of drying, as powder applied over a moist skin may cause chafing. It is better to wipe the napkin area with a little pure oil rather than to use powder, as the baby's skin easily becomes sore from wet or soiled napkins, and the oil acts as a protection.

It was once believed that the mouth should be cleaned every day. Now it is recommended that the sensitive mucous membranes should be left strictly alone, because many mothers have infected their babies' mouths by breaking the membrane with sharp finger nails or otherwise. Nature will keep the mouth clean with the saliva until the baby gets his teeth. The membrane which lines the baby's ears and nose is tender, too. Never poke at these parts with hair-pins or similar articles. If cleansing is required a little cotton wool twisted to a point and dipped in oil will do the job quite well.

Next month's advice will deal with some common skin irritations. In the meantime, questions on this or any other subject concerning maternal and child welfare will be answered by communicating personally with *the Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters "BABY CLINIC, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Ever Useful Tomato.

Tomato Relish.

Ingredients:—3 lb. ripe tomatoes, 1 lb. onions, 1 lb. sugar, 1 tablespoonful curry powder, 1½ tablespoons mustard, 2 tablespoons flour, salt and pepper to taste. *Method*:—In making the relish, scald the tomatoes first by immersing them in boiling water for a few minutes, then immediately dip them into cold water; this process loosens the skins and they may be quickly and easily peeled without waste. Peel and slice the onions. Put all into a bowl, sprinkle with the salt, and allow to remain overnight, and next morning put into the preserving pan with just sufficient vinegar to cover; add the sugar and boil gently for about 1 hour, then moisten the dry ingredients with a little cold vinegar and stir them into the mixture. Boil all together for another hour or until of a nice consistency.

Ripe Tomato Chutney.

Ingredients:—4 lb. ripe tomatoes, 2 lb. apples, 1 lb. onions, ½ lb. sultanas, 2 level teaspoons salt, ¼ teaspoon pepper, ½ dozen cloves, 1 small piece whole ginger, 3 small chillies, 1¼ pints vinegar, 1¼ lb. sugar, 1 teaspoon mustard seed. *Method*:—Peel, core, and cut up the apples, peel and slice the onions, and tomatoes. Tie the cloves, ginger (bruised), and chillies in a spice bag and simmer till a good consistency (about 2 hours).

Spiced Tomato Butter.

Ingredients:—5 lb. nice red tomatoes, 1½ lb. apples, 4 lb. sugar, 1 pint vinegar, ¼-oz. stick cinnamon, ¼ oz. ginger, 2 blades mace, few cloves. *Method*:—Cook the mixture rather slowly for about 3 hours or until all ingredients are nicely blended.

Tomato Sauce (1).

Ingredients:—Take a quantity of tomatoes, say, about 20 lb., and pulp them by boiling rapidly until quite soft (no water should be added, but the tomatoes should be slightly crushed to commence the boiling). Pass the pulp through a sieve which will retain only the seeds and skins, then measure the strained pulp, and to each gallon of this allow 4 oz. salt, 1½ lb. sugar, 1½ oz. garlic, 1 oz. allspice, 1 oz. cloves, 1 tablespoon mustard, ½ teaspoon cayenne, 1 quart good vinegar. *Method*:—The whole spices may be suspended in a loose muslin bag while being boiled and removed at finishing point. The sauce is then boiled until of a right consistency, which may be tested by placing a little of the hot sauce on a plate, and if no watery liquid separates from the solid sauce, it is ready for bottling off into hot sterilized sauce bottles, and, when bottled, should be cooled off at once.

Tomato Sauce (2).

Ingredients:—40 lb. tomatoes, 2½ lb. cored and peeled apples, 3 lb. sugar, 6 oz. salt, 1½ teaspoons cayenne pepper, 2 quarts vinegar, 2 oz. cloves, 2 oz. black pepper, 2 oz. allspice, 2 oz. garlic. *Method*:—Boil tomatoes and apples 1½ to 2 hours. Strain well. Stand overnight in an enamel or china bowl. The next day boil all ingredients for 5 or 6 hours, tying spices in a muslin bag.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JULY RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1944.	July, 1943.		July.	No. of years' records.	July, 1944.	July, 1943.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	1·12	42	2·38	0·22	Gatton College ..	1·37	44	3·70	..
Cairns	1·53	61	2·54	0·04	Gayndah	1·47	72	2·14	0·09
Cardwell	1·38	71	3·19	0·09	Gympie	2·07	73	4·31	0·04
Cooktown	0·98	67	2·87	0·35	Kilkivan	1·50	62	2·02	0·07
Herberton	0·89	57	1·75	0·05	Maryborough ..	1·93	72	4·36	0·02
Ingham	1·69	51	3·25	0·47	Nambour	2·67	47	6·40	0·03
Innisfail	4·75	62	6·58	1·46	Nanango	1·65	61	1·82	0·06
Mossman	1·19	19	5·73	0·77	Rockhampton ..	1·73	72	2·23	0·11
Townsville	0·67	72	1·24	..	Woodford	2·28	55	5·48	..
Central Coast.					*Central Highlands.*				
Ayr	0·73	56	0·28	..	Clermont	1·06	72	1·31	..
Bowen	0·93	72	0·28	..	Springsure	1·18	74	1·05	..
Charters Towers ..	0·67	61	0·99	..					
Mackay	1·64	72	0·57	0·02	*Darling Downs.*				
Proserpine	1·58	40	0·84	..	Dalby	1·71	73	2·44	0·27
St. Lawrence ..	1·36	72	1·55	0·04	Emu Vale	1·57	47	2·21	0·58
					Jimbour	1·48	64	3·29	0·09
South Coast.					Miles	1·62	58	1·54	0·26
Biggenden	1·41	44	2·02	..	Stanthorpe	2·00	70	3·01	1·27
Bundaberg	1·83	60	2·82	..	Toowoomba	2·06	71	3·44	0·32
Brisbane	2·16	91	4·65	0·16	Warwick	1·80	78	2·81	0·62
Caboolture	2·37	67	5·89	..					
Childers	1·70	48	2·90	0·10	*Maranoa.*				
Crohamhurst	2·90	50	8·14	0·09	St. George	1·21	62	2·13	0·48
Esk	1·90	56	3·48	0·18	Roma	1·43	69	2·12	0·16

CLIMATOLOGICAL TABLE FOR JULY, 1944.

Compiled from Telegraphic Reports.

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns	..	77	64	81	10, 11	58	15	254	8
Herberton	..	69	49	77	12	41	15, 16, 17	175	6
Townsville	..	76	59	79	11, 12	49	21	124	5
Brisbane	30·19	68	49	79	30	39	20	465	13
Darling Downs.									
Dalby	..	67	43	76	6, 7	25	21, 22	244	6
Stanthorpe	..	59	38	69	6, 7	19	21, 22,	301	11
Toowoomba	..	60	45	71	30	32	20	344	14
Mid-Interior.									
Georgetown	30·03	80	58	86	5	45	16	119	2
Longreach	30·20	75	47	82	29, 30, 31	36	21	110	4
Mitchell	30·24	66	41	75	30	26	21	232	3
Western.									
Burketown	..	80	56	87	4, 5	48	14	139	2
Boulia	30·15	70	46	79	3, 28, 29	37	21	99	3
Thargomindah	30·21	68	42	80	29	34	23	64	2

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

SEPTEMBER.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			CORRECTION IN MINUTES FOR OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
1	6·03	5·33	Cairns	+ 26	+ 32	Longreach ..	+ 34	+ 36
6	5.58	5.36	Charleville ..	+ 27	+ 27	Rockhampton ..	+ 9	+ 11
11	5.52	5.38	Cloncurry ..	+ 48	+ 52	Roma	+ 17	+ 17
16	5.46	5.40	Cunnamulla ..	+ 28	+ 30	Townsville	+ 23	+ 27
21	5.40	5.42	Dirranbandi ..	+ 19	+ 19	Warwick	+ 4	+ 4
26	5.35	5.45	Emerald	+ 18	+ 20	Winton	+ 38	+ 42
30	5.30	5.46	Hughenden ..	+ 34	+ 36	Quilpie	+ 35	+ 35

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	p.m.	a.m.
1	3.45	4.36
2	4.53	5.27
3	6.02	6.15
4	7.10	6.59
5	8.17	7.42
6	9.21	8.23
7	10.25	9.05
8	11.29	9.48
9	..	10.33
	a.m.	
10	12.25	11.20
		p.m.
11	1.23	12.10
12	2·15	1.02
13	3.04	1.55
14	3.48	2.48
15	4.28	3.41
16	5.05	4.34
17	5.40	5.25
18	6.13	6.16
19	6.44	7.07
20	7.16	7.59
21	7.49	8.52
22	8.24	9.45
23	9.02	10.40
24	9.44	11.37
25	10.31	..
		a.m.
26	11.23	12.33
	p.m.	
27	12.21	1.29
28	1.24	2.23
29	2.30	3.14
30	3.37	4.02

CORRECTION IN MINUTES FOR SOUTHERN DISTRICTS.

Charleville + 27; Cunnamulla + 29; Dirranbandi + 19;
Roma + 17; Quilpie + 35; Warwick + 4.

(Corrections to be added to both times of Rising and Setting.)

CORRECTIONS IN MINUTES FOR CENTRAL DISTRICT.

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 28	+ 12	+ 42	+ 27	+ 17	+ 2	+ 49	+ 30
6	+ 16	+ 21	+ 32	+ 37	+ 7	+ 12	+ 36	+ 42
11	+ 12	+ 27	+ 28	+ 43	+ 2	+ 18	+ 31	+ 50
16	+ 14	+ 24	+ 30	+ 39	+ 5	+ 14	+ 34	+ 44
21	+ 22	+ 15	+ 38	+ 31	+ 13	+ 6	+ 44	+ 35
26	+ 27	+ 12	+ 44	+ 26	+ 19	+ 1	+ 51	+ 29
30	+ 23	+ 14	+ 39	+ 30	+ 14	+ 6	+ 45	+ 33

CORRECTIONS IN MINUTES FOR NORTHERN DISTRICTS.

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 45	+ 11	+ 61	+ 38	+ 46	+ 23	+ 38	+ 11
3	+ 37	+ 19	+ 55	+ 44	+ 40	+ 29	+ 33	+ 18
5	+ 26	+ 29	+ 48	+ 50	+ 34	+ 35	+ 23	+ 25
7	+ 17	+ 38	+ 46	+ 56	+ 28	+ 41	+ 16	+ 33
9	+ 11	+ 45	+ 38	+ 61	+ 23	+ 46	+ 10	+ 38
11	+ 10	+ 49	+ 37	+ 63	+ 23	+ 48	+ 9	+ 40
13	+ 10	+ 47	+ 37	+ 62	+ 23	+ 47	+ 10	+ 39
15	+ 14	+ 42	+ 40	+ 59	+ 27	+ 44	+ 14	+ 36
17	+ 21	+ 35	+ 44	+ 55	+ 29	+ 39	+ 18	+ 30
19	+ 29	+ 27	+ 50	+ 51	+ 35	+ 36	+ 25	+ 24
21	+ 36	+ 19	+ 55	+ 44	+ 40	+ 29	+ 32	+ 18
23	+ 43	+ 12	+ 60	+ 38	+ 44	+ 24	+ 36	+ 12
25	+ 48	+ 9	+ 64	+ 36	+ 48	+ 23	+ 40	+ 9
27	+ 50	+ 8	+ 65	+ 35	+ 49	+ 22	+ 42	+ 8
30	+ 39	+ 16	+ 56	+ 41	+ 42	+ 26	+ 33	+ 15

NOTE.—The plus sign (+) means later than Brisbane time.

PHASES OF THE MOON.

Full Moon, 3rd September, 6.21 a.m.; Last Quarter, 9th September, 10.03 p.m.; New Moon, 17th September, 10.37 p.m.; First Quarter, 25th September, 10.07 p.m.

PLANETS.

Venus.—Observable low in the west during evening twilight in the constellation of Virgo. It passes close to Mars on the 10th and close to Spica on the 22nd.

Mars.—Observable low in the west during evening twilight in the constellation of Virgo. At the end of the month it is too close to the Sun for observation. Passes close to Spica on the 30th.

Jupiter.—Late in the month, observable low in the east during morning twilight; in the constellation of Leo.

Saturn.—Observable in the east in the morning hours, rising an hour or so after midnight. During the month this planet is in the constellation of Gemini.

SPRING EQUINOX.

The Spring Equinox for the Southern Hemisphere occurs at 2 p.m. on 23rd September. On this day the Sun will rise and set at the true east and west points respectively. As the word "equinox" signifies "equal night" it may be expected that the day and night

will be equal; but there is so much daylight before sunrise and after sunset (twilight) that much of the meaning is lost. However, the Sun is above the horizon for half the 24 hours at this time of the year.

For most people this is a welcome time. Winter has passed, and there is evidence of new growth; although in the milder zones evidence of Spring will have been visible for some time. The astronomical commencement of Spring, however, is the Spring Equinox. Often in this hemisphere the "Harvest Moon" is falsely associated with the September Equinox, because the Full Moon nearest the September Equinox is known as the "Harvest Moon" in the Northern Hemisphere. It must have been noticed by almost everyone that the Moon rises on an average about three-quarters of an hour later every day. At the time of the September Equinox, however, the Full Moon is at that part of its orbit where it is moving north most rapidly. This condition to those in the Northern Hemisphere reduces the difference between the times of daily rising of the Moon to a minimum, and to those in the Southern Hemisphere increases the daily difference to a maximum—*e.g.*, the nearest Full Moon to the equinox this year is 2nd October, and the daily differences for English latitudes from 1st October to 5th October are 22 minutes, 22 minutes, 24 minutes, 29 minutes, a total of only 97 minutes in four days. For the same latitude in the Southern Hemisphere, however, the differences are 97 minutes, 97 minutes, 95 minutes, 90 minutes—over 90 minutes in one day. The greater the distance from the Equator, the more marked this phenomenon becomes. In Queensland, where the latitude is less than 30 degrees, the effect is not very noticeable—66 minutes, 66 minutes, 65 minutes, 64 minutes over the same period stated above. The effect of this Full Moon rising for several evenings so close to sunset is of immense help to harvesting operations in England, which must be carried out quickly, and full use is made of the bright Moon. The nearest Full Moon to the September Equinox thus was known as the "Harvest Moon." The following Full Moon, where the conditions are similar but less marked, occurs during the hunting season and became known as the "Hunter's Moon."

At the March Equinox the reverse conditions take place. The maximum difference between daily times of rising of the Moon then occurs in the Northern Hemisphere and the minimum difference to observers in the Southern Hemisphere. In this country, however, harvesting is well over by March and no advantage comes from the phenomenon as does from the September Moon in the fields of England.

AUGUST WEATHER IN QUEENSLAND.

Normally dry conditions prevailed in the Lower Carpentaria, Upper and Lower West and North Coast, Barron, otherwise the greater part of the State received useful to very beneficial rain, varying from 10 per cent. above average in the Central Lowlands to 260 per cent. and 337 per cent. in the Maranoa and far South-West. Rain periods were chiefly in the first and third weeks, especially the latter, and were due in great part to mild out-of-season monsoonal influences with their usual accompanying soaking falls and local thunderstorms. In the dry southern interior many good 2 to 3-inch aggregate totals followed previous partial but belated relief. Throughout most of the State, a normal sequence of early spring and summer storms should maintain the present fair to good prospects.

Temperatures.—Maximum temperatures ranged from 0.7 degrees below normal at Rockhampton and Thargomindah to 2.3 degrees above at Longreach. Minimum temperatures below normal at Cloncurry, 1.8 degrees Boulia and Rockhampton, otherwise in central and southern districts the range was from 1.6 degrees above at Thargomindah to 3.7 degrees at Stanthorpe. Mean minimum at Mitchell, 42 degrees, was the fourth highest on record.

The rain position is summarised below:—

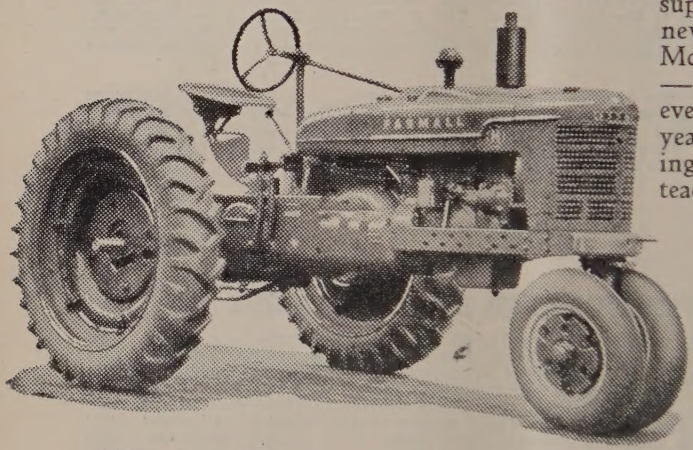
Division.	Normal Mean.	Mean August, 1944.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	20	23	15 above
Peninsula South	7	13	86 ,,
Lower Carpentaria	10	1	90 below
Upper Carpentaria	25	38	52 above
North Coast, Barron	114	76	33 below
North Coast, Herbert	167	240	44 above
Central Coast, East	77	80	4 ,,
Central Coast, West	50	86	72 ,,
Central Highlands	84	113	35 ,,
Central Lowlands	48	53	10 ,,
Upper Western	16	3	81 below
Lower Western	32	24	25 ,,
South Coast, Port Curtis	118	141	20 above
South Coast, Moreton	169	203	20 ,,
Darling Downs East	131	272	108 ,,
Darling Downs West	88	250	184 ,,
Maranoa	91	328	260 ,,
Warrego	75	195	160 ,,
Far South-West	49	214	336 ,,

Commonwealth Meteorological Bureau, Brisbane.

McCORMICK-DEERING

FOOD WEAPONS

HERE on the home front in history's greatest battle for FOOD, every farm tractor is mobilized for service. Every operator "drives a weapon" in this war for Victory and Freedom. Our soldiers, our civilians, the people of Britain, and the peoples of the liberated nations must have food—meats, butter, vegetables and fruits—in ever-increasing quantities to help win and hold the peace for which our boys in uniform are fighting. Therefore, our Government has specially imported supplies of new tractors. These new tractors include the latest McCormick-Deering models — "Food Weapons" with everything that more than 30 years of experience of building and using tractors can teach in *efficiency, economy,* and *adaptability* for Food Production.



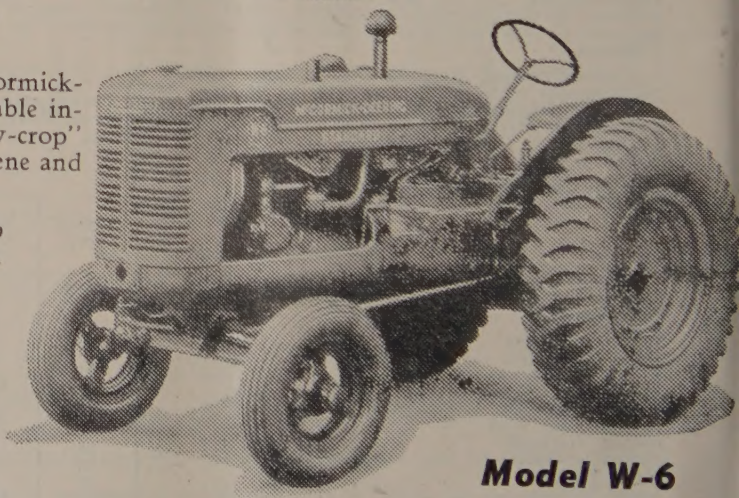
Available on steel wheels, or rubber tyres for approved purposes.

Farmall-H

The full range of McCormick-Deering tractors available includes the latest "Row-crop" and "Standard" kerosene and diesel fuel models.

An official "permit to purchase" is necessary.

Your nearest International Harvester Agent will be glad to give you full details and help you with your application.



Model W-6

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